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English language and translation

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RETRANSLATION AND NORMATIVE CHANGES IN FINNISH
TRANSLATION OF NON-FICTION

A comparison of two Finnish translations of Charles Darwin's *On the Origin of
Species*

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Tiivistelmä – Abstract <p>This study looks into the normative changes that have taken place in Finnish translation of non-fiction during the last century. This is done by comparing two translations of the same text, Charles Darwin's <i>On the Origin of Species</i>, published in 1913–1917 and 2009. The main goal of the study is to examine whether differences between the two translations can be attributed to changes in translation norms of non-fiction. This is accomplished by analysing the research material for various textual features, and comparing the findings with previous research on translation norms. The present study is based on translation norm research by Toury (1980), Hermans (1991) and Chesterman (1997).</p> <p>The theoretical background is based on retranslation research and norm-based approaches to translation studies. The purpose of the theoretical background is to give a clear, thorough picture of the fields in question, as well as to justify the need for this research.</p> <p>The research material consists of selected paragraphs of the two Finnish translations, based on the same sections of the source text. This study utilizes a twofold research method: a statistical analysis based on a morphosyntactic analysis of the research material, combined with a close reading of the same material. The two methods are closely interwoven: the purpose of the statistical method is to uncover differences in the distribution of various textual features, while the textual analysis aims to exemplify and explain the reasons behind these differences, linking the findings to various translation norms of non-fiction.</p> <p>The analysis shows that the two translations differ from each other significantly in the distribution of certain textual features, including verb infinitive form use, person of verbs, and possessive suffix use. The most striking changes, however, are related to syntax. The older translation features significantly longer, more complex sentences, while the newer translation seems to favour shorter sentences and subordinate clauses. These findings can be reasonably attributed to normative changes that have taken place in Finnish translation of non-fiction. I have linked the most important findings to four main norms of non-fiction translation: objectivity, conciseness, readability, and clarity of information.</p>			
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Tiivistelmä – Abstract			
<p>Tämä tutkimus keskittyy suomennetun tietokirjallisuuden muuttuneisiin normeihin viimeisen sadan vuoden aikana. Tutkimus vertaa kahta suomenkielistä käännöstä Charles Darwinin <i>Lajien synnystä</i>, jotka julkaistiin vuosina 1913–1917 ja 2009. Tutkimus pyrkii selvittämään, onko käännösten eroja mahdollista selittää tietokirjallisuuden käännösnormien muutoksella. Tätä varten käännöksiä verrattiin toisiinsa, etsien eroja erilaisten tekstuaalisten piirteiden esiintymistiheydessä. Näitä eroja verrattiin aikaisempiin käännösnormeja käsitteleviin tutkimuksiin ja aineistoihin. Tutkimus pohjaa laajalti Touryn (1980), Hermansin (1991) ja Chestermanin (1997) teorioihin ja ajatuksiin käännösnormien tutkimuksesta.</p> <p>Teoriaosio pohjautuu uudelleenkääntämisen tutkimukseen ja normitutkimukseen käännöstieteissä. Teoreettisen osion tarkoituksena on antaa selkeä kokonaiskuva em. alueista, joiden tunteminen on olennaista tutkimuksen kannalta.</p> <p>Tutkimusmateriaali koostuu kappaleista kahdesta suomennoksesta, jotka pohjautuvat samaan osaan lähtötekstiä. Tutkimusmenetelmä on kaksiosainen: ensimmäisenä tuleva tilastollinen analyysi pohjaa tutkimusaineiston morfosyntaktiseen analyysiin, mitä seuraa lähilukuun perustuva tekstianalyysi. Nämä kaksi tutkimusmetodia liittyvät läheisesti toisiinsa. Tilastollisen menetelmän tarkoituksena on nostaa esiin eroja tekstuaalisten piirteiden esiintymistiheyksissä. Tekstianalyysi puolestaan pyrkii selittämään näiden erojen syitä ja linkittämään löydöksiä tietokirjallisuuden kääntämisen normeihin.</p> <p>Tutkimustulosten analyysi osoittaa, että käännökset eroavat toisistaan merkittävästi tiettyjen tekstuaalisten piirteiden esiintymistiheydessä. Näitä ovat mm. verbien infiniittimuotojen käyttö, verbin persoonamuodot sekä possessiivisuffiksit. Kaikkein merkittävimmät erot liittyvät kuitenkin syntaksiin. Vanhemman käännöksen virkkeet ovat pitempiä ja virkerakenne on monimutkaisempi kuin uudemmassa käännöksessä, joka suosii lyhyempiä virkkeitä ja sivulauseita. Nämä löydökset voidaan uskottavasti selittää tietokirjallisuuden käännösnormien muutoksilla. Olen yhdistänyt tärkeimmät löydökset objektiivisuuden, tiivyyden, luettavuuden ja tiedon selkeyden normeihin.</p>			
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1 Introduction

The present study is a case study concerning retranslation, language change and changes of translation norms in Finnish translations of non-fiction. The aim of this study is to shed light on how changes in the translation norms of non-fiction manifest themselves on different textual levels.

The initial idea for this research was first conceived two years ago when I was doing my Bachelor's thesis on retranslation in the context of literary translation. While doing background research for my BA Thesis, I was a bit perplexed to find out that almost all of my sources were closely tied to translations of literature, with next to no mention of non-fiction. This shortcoming has also been noted by Koskinen and Paloposki (2010: 295), who add that while there are some scholars who have studied non-fiction, they are a clear minority. Somehow the context of non-fiction has been almost completely excluded from the field of retranslation, even though retranslation is a common practice in non-fiction, and is by no means a new field of research in translation studies. Because of this, they argue, the findings and conclusions of previous retranslation research can only be extended beyond the sphere of literary translation with caution. As a result, we are left in a place where we have no clear idea about how retranslations of non-fiction differ from those of literary translations. This study will try to do what it can to help close this gap.

According to Toury (2004: 208), most of the previous research on translation norms has focused on literary, philosophical and biblical translation. He has called for norm research on different fields of translation, since we cannot expect the same conditions to apply to all sorts of translation. This study aims to examine how norms of translation have changed in the field of non-fiction.

One could argue that because of the accumulative nature of scientific knowledge, there is no need to retranslate old works of non-fiction; they serve the scientific community their time, after which they are replaced by new works with (hopefully) more accurate information. However, scientific literature has its classics, too. There will always be books that will be read for centuries, even millennia, after their first publishing because of their massive impact on some particular field of science (a prime example being the works of ancient Greek philosophers). In my personal opinion, preserving such works has intrinsic value. Because of these factors I consider the subject to be worth studying.

As noted in a recent publication by the Institute for the Languages in Finland (*Suomen kielen tulevaisuus*: 114), English is by far the most common language in international scientific publishing. According to Paaskoski (2008: 362), we should strive for a situation in which all

scientific knowledge is available for everyone instead of just a small elite. Producing up-to-date, intelligible translations of scientific literature is thus important in order to preserve our democratic way of life. As noted by the Institute for the Languages in Finland (*Suomen kielen tulevaisuus*: 133), translating both new works as well as classics of foreign non-fiction is also necessary in order to ensure that Finnish researchers have a common, functional terminology to share with their colleagues and discuss their respective areas of study. Thus this study also has an ideological motive behind it: to draw attention to the importance of translating non-fiction to Finnish.

The purpose of this study is to research how translation norms of Finnish non-fiction have changed during the last hundred years, as well as the effects these changes have had on translations. This is done by examining two translations of one non-fiction text, Charles Darwin's *On the Origin of the Species*. The translations in question are the first edition of the first Finnish translation from 1913–1917 by A.R. Koskimies, and the latest, most up-to-date version from 2009 by Pertti Ranta.

It is hypothesized that there are significant differences between the two translations on various textual levels, ranging from word class distribution to syntax. It is also hypothesized that these differences can be explained in terms of translation norms, which have changed during the last hundred years. The older translation is expected to adhere to the norms of its time, such as being syntactically loyal to the source text, while the new translation is expected to follow contemporary translation norms, such as readability, functionality, and fluency of information. The analysis aims to find out whether the two translations differ from each other in ways that can be attributed to normative changes in the field of non-fiction translation.

The structure of the study is as follows: section 2 serves as an introduction to non-fiction and the field of retranslation, exploring some of the most common ideas related to the field, including causes and reasons for retranslation, effects of retranslation, and determining how retranslations differ from other translations. Section 3 introduces norm-based approaches to translation studies. Section 4 contains descriptions of the research method and material. Section 5 includes the analysis, with section 6 concluding the study.

2 Non-fiction and retranslation

The purpose of this section is to define and introduce two central terms, *non-fiction* and *retranslation*. I will start with the term *non-fiction* by contrasting it with *fiction*. The term is approached from two angles: first, in terms of its contents, second in terms of its function. I will then move on to introduce some key concepts and ideas of the field of retranslation, as well as present some of the more common arguments and questions related to this field of study, mainly concerning the reasons and effects of retranslation.

As Jussila (2006: 12) says, everyone knows what non-fiction is, but it is difficult to define the concept all-inclusively. The Finnish Association of Non-Fiction Writers (Suomen tietokirjailijat ry) starts by dividing literature into two main categories: *non-fiction* and *fiction*. Non-fiction includes texts such as newspaper stories, editorials, scientific articles and textbooks, while fiction includes creative texts such as poems, novels, and plays. According to the association, 80% of all literature published in Finland is non-fiction. Although only 16% of all publications in Finland are translations (Kantola 2013: 632), almost a fifth of all publications are written in a foreign language, mainly English. According to Kantola, this is explained by the high number of scientific publications written originally in English, aimed at the international scientific community.

The basic difference between non-fiction and fiction is that non-fiction is based on true, real events, while fiction takes place within the realm of imagination. This definition is a simplification, as the line is often not that clear-cut: fictive works can, for example, be based on real people and real events, but involve features that have been created by the author. On the other hand, the entire notion of value-free, absolute truth has been a matter of debate for millennia, which makes all definitions of non-fiction based on truth somewhat questionable.

For the purposes of this study, non-fiction is defined as *all factual literature, written with the primary purpose of conveying information, containing information that is public and generally accepted as true*. This study concerns the translations of a non-fiction text, Charles Darwin's *On the Origin of Species*, which could further be categorized as a scientific book concerning evolutionary biology and natural selection.

As touched upon in the definition above, non-fiction and fiction often have different purposes or functions. It could be argued that the primary function of non-fiction is to *convey information*, while the primary function of fiction is much more elusive and difficult to pin down. Surely there are various functions of fiction, such as *to entertain* or *to evoke thoughts*, even *to simulate the human*

experience. However, all of these feel lacklustre and insufficient: perhaps because there is no single, primary purpose for fiction. Nevertheless, venturing deeper into this subject matter is beyond the scope of this study, as this study focuses on non-fiction which has been defined sufficiently.

Koskinen and Paloposki (2010: 294) define a retranslation as a second or later translation of a single source text that has already been translated into the same target language. Other scholars have extended this definition to include indirect translations, but for the purposes of this study indirect translations are excluded from the definition. The reasoning for this is that unlike retranslation, indirect translation involves an extra language and should be studied and discussed separate from the subject of retranslation in order to avoid misunderstandings. For the purposes of this study the term retranslation is defined as *two or more translations based on the same source text, written in the same target language*.

In a prototypical setting the translations are temporally separated: a first translation is followed by a later one (Koskinen and Paloposki 2010: 294). However, Koskinen and Paloposki note that this is not always the case. There are known cases in which a text has been translated simultaneously by two translators, resulting in a situation in which it may be difficult or even impossible to classify either text as the first. Nevertheless, most studies dealing with retranslation tend to focus on the effects of time. What makes retranslation such a unique research subject is the fact that both source text and target language always remain the same, which allows the researcher to focus on the variable of time and the effects it has on the language of the later translation. Because of this, retranslation offers an excellent platform for studying norms of translation.

Paloposki and Koskinen (2010: 295) note that most previous research on retranslation has concerned literary translation, especially classics of world literature. There are scholars who have studied retranslation of non-fiction (see Brisset 2004, Susam-Sarajeva 2006), but they are a clear minority. Given the fact works of non-fiction form a sizeable part of all publications – at least in Finland – it is interesting to see how little the subject has been studied in the framework of retranslation research. This study attempts to help fill this gap in the field. Since non-fiction and fiction are different types of texts, Paloposki and Koskinen call attention to the fact that most of the findings and conclusions of previous retranslation research can only be extended beyond the sphere of literary translation with caution. However, this does not mean that the theoretical tools and terms that are used to study literary retranslation could not be applied to non-fiction.

2.1 Retranslation, revision and re-editing

Although the definition of retranslation given above may at first seem clear-cut, it is not always easy to determine which texts should be categorized as a retranslations. Vanderschelden (2000: 1–2), for example, has stated that revision is often seen as the first step towards retranslation. Other researchers, such as Koskinen and Paloposki (2015: 202–203) have argued that differentiating between retranslations, new editions, revised editions and other similar categories is not as straightforward. According to their research, there is no universally agreed definition or standard for such categories. Some translations get labeled as revised editions, although their text has only undergone minor corrections to spelling, while other revised editions have in fact been almost completely retranslated (2015: 153). The degree to which retranslations utilize older translations also varies greatly: some texts marketed as retranslations are only partly retranslated and borrow parts or segments of previous translations, while others do not utilize earlier translations at all. Because of this, Paloposki and Koskinen (2010: 294) call for a close textual reading before deciding whether a translation can be called a retranslation to begin with.

In the case of the present study, it is evident that the latest translation has clearly been translated separate from the first one: the translator has changed, almost a hundred years have passed, and the book was marketed as a retranslation. There are no notable similarities on word choices or sentence structure, so there is no ground for suspecting the translation of being a modification of the previous translation instead of a true retranslation.

2.2 Why do translations require retranslating?

According to Koskinen and Paloposki (2015: 68), the need for retranslation is often explained in one of two ways: either the existing translation is seen to be inaccurate in its portrayal of the original, or the translation's language is considered 'aged' or inadequate in some other way. It is important to notice that the former explanation is related to the translation's relation to the source text, the latter to the translation's relation to the target language. Koskinen and Paloposki (2010: 296) list possible causes for retranslating a text, including *(alleged) ageing of translations*, *increased knowledge of the source text*, and *deficiency of first translations*. Helin (2005: 145–161) adds *changes in language, society, ideology and culture* to the list of possible causes. Most researchers in the field agree that there are often multiple possible causes or reasons for

retranslating a text, and often many factors are at play simultaneously. Some of the more common reasons are introduced in more detail below.

2.2.1 Ageing of translations

One of the most common arguments for retranslating is said to be the ‘ageing’ of translations. In the context of retranslation, the term ageing refers to the way readers’ perceptions of a text change when time passes. It is often suggested that for some reason translations – especially first translations – seem to suffer from ageing, which makes them feel old, archaic or clumsy to readers, while source texts seem to strive on indefinitely (see Berman 1992, quoted in Deane-Cox 2014: 5). While popular, such remarks are based on a common misconception. In fact, source texts *do* change as well: original texts are rewritten and updated all the time. As Mäkinen (2008: 419) notes, most contemporary British readers would struggle to understand *Hamlet* without explanatory annotations that are included in the modern revised versions. Montgomery (2000: 282) agrees, noting that a vast majority of the works published prior to the late 1500s have only survived to the present day as collections of fragments gathered from numerous different sources.

It is not clear where this deep-rooted belief about an unchangeable, static source text originates from. Koskinen (1995: 10) has noted that the effects of time are often seen to be harder on translations than on their source texts. Venuti (1992: 3) proposes that we may consider source texts immune to linguistic, cultural and social change because they are seen as individualistic expressions of the author, while translations are seen as mere interpretations. It seems that source texts are considered to be more durable because of their originality. This idea is supported by Bahtin (1987: 15, in Mäkinen 2008: 421), according to whom we have an unconditional tendency to consider everything original and old intrinsically good and valuable. The reason why translations seem to age faster than source texts is not necessarily related to differences in the texts at all: it may have more to do with the way source texts and translations are *perceived* by readers.

Despite the popular opinion, it can be said that the original is not static, but unstable. Because of this, it is reasonable to assume that at least some of the mechanisms of ageing that affect translations affect source texts as well. However, this does not necessarily mean that translations and source texts age at the same speed. Goldschmidt (2001: 407, quoted in Helin: 2005) has proposed that since translations seem to age and require revisiting more often than source texts,

classics of world literature should be rewritten every 100 years and retranslated every 50 years. Similar propositions have been made by various researchers (see Koskinen and Paloposki 2015).

To complicate matters further, some translations seem to age faster than others (Sorvali and Häkkinen 2007: 380). In some cases this can be explained by canonization: the first translation may sometimes be preferred simply because it is the first one, the one readers are familiar with and accustomed to. Another possible reason proposed by Sorvali and Häkkinen is related to the status of the translator: some Finnish translators, for example, have been closely involved in the development of Finnish literature, which has led to their language being considered ‘normative’ later on.

2.2.2 Reinterpretation of source texts

Human beings interpret all phenomena from their own subjective standpoints. Every interpretation is tied to time and place, and all interpretations have their roots in our subjective view of the world. That being said, no man is an island, and there are intersubjective similarities between our standpoints. Deane-Cox (2014: 192) has suggested that the reason we retranslate does not lie in the deficiency of the translation, but in the impermanence of the source text, which allows for a new interpretation at each new reading. Different readers – and translators – can lift certain elements of a text to the foreground, which will result in differing interpretations.

As time passes, our interpretations of texts are prone to change. Major events and ideas of world history, such as the World Wars, theory of relativity, theory of evolution, feminism or the development of the Internet have all had massive impact on the way we view the world. Each generation has more knowledge about the surrounding world than the previous one, which allows for a steady change in the way we interpret the world. The idea of each generation creating its own interpretations is common in all literary discourse (Koskinen and Paloposki 2015: 203), also in literary translation. As Koskinen and Paloposki state, retranslation is, after all, a very concrete form of reinterpretation.

However, translations are not merely passive voices that reflect their surroundings. As Lefevere (1992: 13) notes, both writers and rewriters (the notion of *rewriter* includes translators in general) can choose to either adapt to the system or go against it. They are active agents, and have the power to go against the constraints of a system, for example by reading works of literature in different ways. They can choose to actively look for different interpretations. Rewriters have the power to rewrite a work in such a way that it does not fit to the dominant practice or ideology. In other

words, translations can also shape the way we interpret the world by challenging pre-existing, conventional ideas. Even-Zohar (2004: 200–202) has tackled such ideas in his polysystem theory, which suggests that literature can be viewed as a “system of systems”, consisting of various smaller systems such as translated literature, non-fiction, fiction, and so forth. According to Even-Zohar, all literary polysystems are in a constant state of transformation. He notes that a literary system is weak when it is first conceived, and has to borrow from other, more established literary systems via translation in order to develop further. In Even-Zohar’s view, a young literature cannot produce texts of all imaginable genres in its infancy: it takes time for young systems to develop to the point when they are ready to produce authentic texts of their own. The system of translated literature can therefore be thought to shape the entire polysystem of literature, which in turn shapes the way we view the rest of the world. When a text is later retranslated, the changes that have taken place in the literary polysystem affect the outcome of the new translation.

Not all rewriting is progressive and forward-looking. As André Lefevere (1992: 14) notes, the power-holders of the literary system – critics, reviewers, teachers and translators – can also repress texts that oppose the current poetics too harshly. Lefevere (1992: 19) writes that we often rewrite texts to bring them in line with new, dominant poetics of our time. This stance towards rewriting and retranslation is conservative in nature, as it opposes progress and promotes conformity. This idea is clearly evident in norm-based approaches to translation, which will be discussed in more detail in section 3.

Theoretical advances in translation studies can also affect the entire literary polysystem, and may therefore provide a demand for retranslation. The field of translation studies and ideas about translation in general have developed immensely during the last hundred years. Introduction of new ideas about different kinds of equivalence, functionality, and skopos theory have changed the way translators think and go on about their work.

Changes in political ideologies can have direct effects on retranslation. A famous example from Finnish translation of fiction is related to George Orwell’s famous dystopian novel *1984* (see Markkanen: 1999). Parts of the first Finnish translation were censored because they drew parallels between the Soviet Union and Nazi Germany. Because Finland had a delicate political relationship with the Soviet Union at the time, the paragraphs were omitted from the first translation (ibid.). The newer translation has not undergone such censorship.

The reasons for retranslation that we have discussed so far are general in nature, and can be thought to affect all sorts of texts, albeit to different extent. There is one more reason that is especially relevant regarding retranslations of non-fiction, which is the introduction of new knowledge and scientific progress. As Ranta (2009: 420–421) notes in his epilogue of the new translation, many of the species described in *Origin of the Species* have been renamed since Darwin's days. The reason for renaming is based on increased knowledge about the genealogy of the species in question. Such information was not available to A.R. Koskimies when he worked on his first translation. Furthermore, Ranta notes that every species of birds and mammals has an official Finnish name.

In retranslation, this increase in knowledge is often discussed using a metaphor of hot and cold translations (see Vanderschelden 2000: 8–11). A first translation is considered 'hot' since it takes place soon after the source text is published. Retranslations, on the other hand, are considered 'cold', since they have a better overall view into the source text: a cold retranslation can take into account the reception and criticism of the first translation, which may help to avoid the same pitfalls. In other words, a 'cold' retranslation has more context and knowledge about the source text to achieve a better, more suitable rendition of the source text.

2.2.3 Retranslation Hypothesis

Perhaps the most well-known attempt to explain why retranslation is needed is the *Retranslation Hypothesis* (from now on referred to as RH), based on Antoine Berman's theories about retranslation. RH in its simplified form suggests that first translations are always domesticating in style, therefore requiring retranslation (Berman 1990, in Koskinen & Paloposki 2010: 295). According to Bensimon (1990: ix, in Paloposki & Koskinen 2001: 27), this is because their primary purpose is to integrate one culture to another, and to ensure that the original text is well received in the target culture.

RH has been researched extensively, but the results have not been clear: some studies seem to validate the hypothesis (see Paloposki 2002), while others point to the opposite direction (see Oittinen 1997). Paloposki and Koskinen (2001: 29–32) have noted that a 'domesticating phase' often takes place in the development of a young literary system. However, even if all the translations published during such a phase turned out to be domesticating in style, one cannot assume that domestication is a universal feature of first translations (ibid.). This 'weak' formulation of RH does not make any universal claims about the nature of first translations (Koskinen and

Paloposki 2015: 84). Paloposki and Koskinen (2001: 29–32) conclude that while RH may apply in certain circumstances, it does not result in all translations following the same formula. Moreover, Paloposki and Koskinen (2001: 28) have suggested that perhaps only domesticating first translations suffer from ageing, while non-domesticating first translations do not (at least not to the same extent). I doubt that a translation – or any text for that matter – can avoid ageing, as language is in constant change. It might take fifty or five hundred years for a text to become ‘aged’ in the eyes of future readers, but it will inevitably happen. The real question is how fast ageing appears, and what are the underlying mechanisms of ageing like.

Koskinen and Paloposki (2015: 63) have noted that discussion concerning retranslation, especially RH, often seems to take a negative stance towards first translations, which are seen as inadequate in some way. This is understandable, as the idea of a lacking first translation is intuitively understood as a strong reason for retranslation. After all, if the first translation was good enough, why retranslate? As the discussion above hopefully demonstrates, such a view – although intuitively tempting – severely underestimates the complexity of the phenomenon of retranslation. Moreover, the idea seems to have an underlying teleological tinge to it, as if literature was constantly ‘developing’ or ‘proceeding towards perfection’.

2.2.4 Canonization and economic factors

In addition to language ageing, reinterpretation and retranslation hypothesis, there are more mundane reasons for retranslation. As Koskinen (2008: 336) notes, reprints of literary classics are steady sellers, therefore being a safe bet for publishers looking to make a profit – they are, after all, profit-seeking enterprises. Although Koskinen is speaking of reprints, the same reasoning has been found to apply to retranslation as well (Koponen 2009).

Paloposki and Koskinen (2010: 295) argue that retranslating and literary canon formation are mutually dependent, since retranslations further bolster the status of classics, which in turn tends to result in new retranslations. Similar ideas have been presented by Lefevere (1992: 20–21), who has argued that institutions such as universities (and the educational system in general) keep canonized works alive by teaching them in classes. He sharply notes that this system guarantees “a substantial turnover for the paperback lists of institutions publishing books”.

2.3 How does retranslation affect the text

So far we have discussed the definition of retranslation, as well as some reasons for retranslation. However, we have not yet discussed how retranslated texts differ from previous translations. This section will give some examples of changes retranslations introduce to texts, based on previous research.

According to Koskinen and Paloposki (2010: 295), retranslations have provided useful data for numerous research questions in translation studies, ranging from translation norms and strategies to language standardization and the effect of political or cultural changes. They note that there is growing interest in finding out what exactly is happening in retranslating. Some examples of possible changes are exemplified below. The examples are based on previous research, and their purpose is to give a rough idea about the ways in which retranslations and first translations may differ. However, it is important to keep in mind that there are as many possible features of retranslation as there are reasons for it: the examples given below are therefore only guiding in nature. Similar results are not necessarily expected from this study.

Koskinen and Paloposki (2001: 29–32) have examined the Finnish translations and retranslations of Oliver Goldsmith's *The Vicar of Wakefield*, and *One Thousand and One Nights*. Their examination revealed that the first Finnish translation of *The Vicar of Wakefield* is much more literal: it is closer to the source text both syntactically and lexically. The second translation, on the other hand, is more fluent and idiomatic, at least partly because it utilizes partitive cases instead of pronoun-structures. In the case of *One Thousand and One Nights*, lexical variation was found to be greater in some of the later translations, as some of the concepts have become more familiar. Translating the word *turban*, for example, has been earlier translated simply as *lakki* (*hat*), later as *turbaani* (2001: 32).

Valtonen (2010) has studied the Finnish translations of *Wuthering Heights* by Emily Brontë in her MA thesis. Her study (2010: 35–45) revealed that the terminology of the older translations is more archaic, resorting to words such as *mamelukki*, *aspi*, and *kerokorvainen*, which are used in modern Finnish. Other findings that separate the old translation from the new one include use of compound words which are nowadays written as two or more separate words (*sensijaan* instead of *sen sijaan*), changes in spelling (*yardi* instead of *jaardi*), differences in case use (*omenain* instead of *omenien* or *omenoiden*), and changes in syntax. Valtonen (2010: 59) notes that although the newer translation has opted for some archaic idioms and expressions as well, for the most part it tends to follow modern language norms.

3 Norm-based approaches to translation

It is generally agreed that the concept of norm was introduced to translation studies by Gideon Toury (Hermans 1999b: 60–75, Chesterman 1997: 63) as an alternative viewpoint that changed the focus from equivalence to translators' decisions. As Toury (2004: 210) has stated, the contradiction between traditional concepts of equivalence and norm-based approaches can only be resolved by postulating that norms determine what kind of equivalence is manifested by actual translations. Study of translation norms has been an integral part of translation studies since the cultural shift in the 1980s (Chesterman 2007: 357). Different scholars have defined and approached the central concept of norm in different ways, some of which are presented below in more detail.

It is worth noting that norms should not be mistaken with their formulation or codification, which limit the individual's choices (Hermans 1999b: 74). This notion is seconded by Toury (1999: 15), who states that a verbalised formation of a norm is not the norm itself, merely a reflection of it. Although this study concerns norms of translation, it is descriptive and non-normative in nature. Moreover, norms act here as explanatory hypotheses, not as foolproof facts of translation.

3.1 Defining the concept of norm

Toury (1980: 51) writes that translation, like any other behavioural activity, is subject to constraints of various degrees. In his view, every constraint imaginable can be placed on a scale between two extremes: absolute rules and pure idiosyncrasies. What is left in the middle ground between the two extremes are norms of different strengths. Toury defines norms as *the translation of general, shared values and ideas of a community into performance-instructions which are acquired during the socialization process*. Their primary function is to act as shared criteria of evaluation for actual instances of behaviour. Norms tell us what is right or wrong, adequate or inadequate, appropriate or inappropriate, and so forth.

According to Toury (1999: 16), the relation between norms, rules and idiosyncrasies can be explained in terms of sanctions. Rules are stronger than norms because breaking them results in sanctions. A norm, on the other hand, may be broken, but such action can cause sanctions. Breaking the weaker idiosyncrasies do not result in sanctions. Rules and idiosyncrasies could well be redefined in terms of norms as “more objective norms” and “more subjective norms” respectively (ibid.). Chesterman (1999: 91) points out that for some reason Toury does not include conventions

on his scale. Chesterman also criticizes the broadness of Toury's definition of norm, stating that we should "not make it so general that it loses its usefulness." (ibid.).

Theo Hermans (1991: 161) defines norms as "constraints on behaviour, foreclosing certain options while suggesting others". Hermans (1999b: 80) also points out that the term has a double meaning: on one hand it refers to regularity of behaviour, on the other hand the underlying mechanisms behind such regularity. In short, "The content of a norm is a notion of what is 'proper' or 'correct' (Hermans 1997: 84)."

A similar view is offered by Chesterman (2007: 357), who agrees that the differentiating factor between norms, laws and conventions is the degree of restraint they place on the translator. Breaking a law results in sanctions and is always faced with heavy criticism, while breaking the more vague conventions does not result in criticism. As with Toury, Chesterman's norms stand somewhere in the middle. He draws focus on the evolutionary function of norms (1997: 55), which is to make life easier by regulating behaviour and maintaining order. However, Chesterman (2007: 358) also points out that a norm-breaking translation can also be received with admiration, sometimes leading to the creation of a new norm. A good example of this is translator Pertti Saarikoski's use of Helsinki slang in his translation of J.D. Salinger's *The Catcher in the Rye*. Although it did not necessarily override the pre-existing norm of using standard language, Saarikoski's translation was admired and is still being discussed today.

It is not easy to determine whether a certain constraint should be considered a rule, a norm or a convention. In some cases the borderlines between different kinds of constraints are bound to remain diffuse and relative (Toury 1980: 52). According to Toury this is not a problem, since the purpose of norm theory is not to offer absolute truths. In his view, the concept of norm is best seen as a tool for studying and describing behaviour (ibid.). Hermans (1999a: 51–52) shares this view, stating that norm-based approaches to translation always view the translator as an active decision maker. He, too, emphasizes the potential of norms as an analytical tool in the study of translation history and ideologies. Furthermore, norms should not be thought of as causative explanations to features found in texts (Hermans 1999a: 57). Instead, the entire process of translation has to be viewed heuristically, using norms as guidance when trying to understand the both the translation and translator.

According to Hermans (1999a: 57), adopting a norm-based point of view allows us to weigh other possible decisions the translator could have made at each step and the reasons behind the final

choices. Using the concept of norms allows us to ask questions not only about what is on the page, but about what could have been on the page. However, determining which factor has influenced the translator at each particular decision is always bound to remain speculation, since the observer always constructs the case from his own viewpoints.

Some researchers (see Chesterman 2007: 363) consider the term itself to be vague in meaning and bound to a theoretical level: a norm is always just an assumption. Norms have also been criticized for being too abstract to be useful. If norms are defined by their general acceptance, exactly how generally accepted do they have to be? Norms are often criticized for promoting circular reasoning: when a regularity is found, a researcher can simply postulate a norm, which in turn will explain the regularity. Moreover, individual works are always a complex sum of decisions affected by various norms, and different readers may project different norms on them, resulting in differing interpretations.

Chesterman points out (2007: 359) that some researchers seem to postulate that every linguistic regularity in a translation can be interpreted as proof of an existing norm. He disagrees with this view, as regularity can always be a result of some external factor, such as cognitive constraints, time and task constraints, incompetency, or chance.

3.2 Formation of norms

When two or more translational options are possible, the translator has to make a choice between them. Since humans have an innate flair for order and stability (Toury 2012: 62–63), they tend to make choices that are agreed upon and accepted by other members of the group. Agreement is reached through a process of negotiation, with or without the use of language. These negotiations lead to the establishment of conventions (*ibid.*).

Toury (2012: 63–64) writes that conventions are not specific or binding enough to guide or assess action. Because of this, newcomers often struggle to acquire social conventions. Toury suspects that there is a missing link at work here, which the notion of norms may be able to provide (*ibid.*). As previously stated, Toury defines norms as general values and ideas shared by a community translated into performance-instructions. Although norms themselves are not strategies of action, they give rise to such strategies (Toury 2012: 63), while also serving as criteria of evaluating instances of action (Toury 1980: 51). According to Toury (1999: 15), norms do not have to be written down or publicly declared; they can remain implicit. However, implicit or even unconscious

norms have to retain the possibility of being verbalized. In other words, a norm that cannot be described in words is not a norm.

A similar idea is proposed by Hermans (1999b: 74), who states that translational choices are affected by certain demands by the source text and the audience of the translation. When these choices are made again and again, patterns will start to emerge as some choices are opted for more often than others. In time, both readers and translators start to consider a certain convention the correct or standard way to act. In other words, a convention has become the norm (Hermans 1999b: 81). This mechanism allows useful, often-used conventions to turn into norms as they become fixed. However, even a fixed norm is not permanent. Norms are historical entities and change over time, and some are more durable than others (Hermans 1999b: 74). This is especially true in situations where two or more competing norms exist.

Chesterman (1997) has discussed translation norms in terms of memetics. Oxford English Dictionary defines *meme* as “*a cultural element or behavioural trait whose transmission and consequent persistence in a population, although occurring by non-genetic means (esp. imitation), is considered as analogous to the inheritance of a gene.*” He writes that all ideas (including norms) concerning translation can be thought of as translation memes, some of which fail while others strive on (Chesterman 1997: 19). If a translation meme survives long enough in the meme-pool it can become a norm. There are clear parallels between this approach and the previously introduced ones by Toury and Hermans.

3.3 Categorizations of norms

This subchapter will introduce two categorizations of norms by Gideon Toury and Andrew Chesterman, both of which will be applied in the present study.

Toury (1980: 53–55) divides norms into three main categories: *initial norms*, *preliminary norms*, and *operational norms*. The first category, initial norms, is related to the relation between source and target cultures. According to Toury, the very first step a translator has to take is to decide whether he wants to subject himself to the source text and culture, resulting in a more literal translation, or to the target culture, which results in more ‘user-friendly’ translation. Using Venuti’s terms, we could also speak of *foreignizing* and *domesticating* translations. Toury emphasizes that the word *initial* refers to the logical priority over preliminary and operational norms, since initial norms are paradigmatic (ibid.). In other words, the translator has to decide which initial norms to

follow before other norm categories become applicable, as they are dependent on the initial norms. The choice of initial norms can also be thought of as choosing the “norm set” of either source or target culture (Toury 2012: 80). Norms concerning the purity of a target language can be considered initial norms, as they have an ideological background and are related to the choice between foreignizing and domesticating a text (Chesterman 2007: 361).

The second category, preliminary norms, direct the general translation policy (Toury 1980: 53). This category includes norms about which books or genres are deemed worth translating, who is allowed to translate, and whether translating through an intermediate language is allowed. These questions are related to the social and cultural aspects of translation (ibid.). A common example of a preliminary norm – at least in Finnish – is that translations of fiction ought to be based on the source text, not another translation (Chesterman 2007: 360). Indirect translation should therefore be avoided when translating works of fiction.

The third category, operational norms, direct actual choices made during translation (Toury 1980: 54). This category includes various textual norms that govern the use of paratext, omissions and insertions, changing the syntactic structure, etc.

Chesterman (1997: 64–70), on the other hand, divides norms into two main categories: *expectancy norms* and *professional norms*. The first category, expectancy norms, includes target language readers’ expectations of what a certain translation should contain, a general consensus about translation tradition in the target culture. Since readers can have expectations about all kinds of things, this category covers a wide range of phenomena. Expectancy norms are primarily validated by their own existence, but to some extent also by norm authorities, such as translators, teachers, and critics.

The second category, professional norms, includes norms that regulate the translation process itself (Chesterman 1997: 67). The source of such norms are “the professionals”, i.e. competent professional translators, whose professionalism in turn is validated by others belonging to the same group. Chesterman argues that if a translator is generally accepted as a professional, the choices he makes are considered norm-setting. The problem with this idea is that translation as a profession is not generally regulated, at least not in Finland: anyone who wants to can act as a translator, even if they do not possess sufficient skills required for the profession. In practice it is difficult to determine who is competent enough to be considered a professional, as ‘general acceptance’ is practically impossible to measure. Chesterman (1997: 68) acknowledges this, stating that while

professional norms can be stated in their absolute form, they can only be followed “as far as possible”.

There are three professional norms (Chesterman 1997: 68–70): the accountability norm, the communication norm, and the relation norm. The first norm, *accountability norm*, is ethical in nature. It concerns the demands of loyalty to the original author, the commissioner, the translator himself, the reader, and any other relevant party. A professional translator is accountable for his work to all of the previously mentioned parties. The second norm, *communication norm*, is a social norm, related to the translator’s central role in optimizing communication between all involved parties. The third and final professional norm is the *relation norm*, which concerns maintaining appropriate relevant similarity between the texts. It is up to the translator to judge which features of each text are the most important or relevant ones.

This study will use both of the previously mentioned categorizations when necessary. In addition to these pre-existing categorizations, new ones will be postulated if deemed necessary.

3.4 Introducing prevalent norms of translation

This section will introduce some norms of translation that have been prevalent in Finnish translation. Section 3.4.1 introduces norms that can be found in all kinds of translation, while section 3.4.2 introduces some norms that can be said to be more characteristic of non-fiction. The norms introduced in this section are purposefully abstract or general in nature, such as “one ought to favour syntactically correct language at the expense of style”, compared to more concrete textual norms, such as “one ought to avoid semicolons”.

Toury (2004: 210) notes that textual-linguistic norms of translation may be identical to the norms of non-translated texts of the same genre, but such relationship should not be taken as granted. I will try to draw attention to this fact in the analysis whenever possible.

3.4.1 General norms of translation

Some of the norms that have been prevalent in Finnish translation since its birth are still adhered to to some extent, while others have evolved further. Although there are some genre-specific norms, most of the more general norms can affect various genres. Certain translation norms that are especially characteristic to non-fiction will be introduced in the following section.

Following Toury's categorization, Chesterman (2007: 360) categorizes **domestication** as a very prevalent initial norm during the early development of Finnish translation. Texts were brought closer to the target language to make them easier to approach for the readers. Although domestication is often given as an example of a norm of translation, Paloposki (2000: 26) has offered a contrasting view. She argues that the tendency to domesticate was not necessarily considered the correct way to translate. In her view, domestication was a result of the surrounding circumstances: written Finnish was still in its infancy, and developing it further seems to have tipped the scales in favour of domestication. Reaching uneducated people unaccustomed to reading was also a major factor when choosing to domesticate. Koskinen and Paloposki (2015: 70–71) have also noted that the division between domesticating and foreignizing translations is not black and white, as it is not uncommon for translators to utilize both strategies within a single translation.

It can be said with relative safety that the more knowledge the translator has about a foreign culture, more accurate the translation can be. The same principle can be applied to readers as well: as Helin (2005: 155) notes, when knowledge of a source culture expands, the average reader can be expected to tolerate more foreign concepts. The average modern Finnish reader knows more about the English-speaking culture than his fellow countrymen from a hundred years ago. As Koskinen and Paloposki (2015: 82) point out, few Finns travelled to Great Britain a hundred years ago, but nowadays it is quite ordinary. Additionally, English culture is now more well-known thanks to advancements in information technology, such as the Internet, TV-series and movies. Increases in cultural knowledge have made domestication less necessary in Finnish translation, but it is still popular in dominant target cultures, such as North-American translation (Puurttinen 2008: 90).

Closely related to the norm of domestication is the norm of **linguistic purism**, which was prevalent in the early development Finnish literature (Chesterman 2007: 360). Similar ideas were common in other European countries as well, and were closely related to the rise of nationalist ideology (Kolehmainen 2009). Finnish language was considered pure, which lead to translators avoiding loan words and calques. Letters and sounds that were not found in Finnish, such as b, c, f, q, x, and z were shunned as non-Finnish. Although the general opinion has watered down since the beginning of the 20th century, remnants of this norm can still be seen in current discussion about the Finnish language: there are still many who think language change is inherently negative (Chesterman 2007: 360). Similar attitudes were faced in a survey by Korhonen and Lappalainen (2013). Their survey revealed that language specialists are not as concerned about language change as laymen are.

Features that concerned the respondents include the growing influence of English and increased use of loan words and calques.

Following Toury's categorization, the norms of domestication and linguistic purism fall under the category of initial norms. In opposition to these very general-level norms, Toury has the category of **operational norms**, which are more closely related to the production of a translation. The norms in this category are more concrete and well-defined, such as whether we allow changes in syntax, use of omissions and additions, use of paratext, and so forth. Operational norms are highly genre-specific: translating a news text and a poem, for example, differ greatly in terms of which textual-linguistic norms are adhered to. It is also important to note that the choice of operational norms is dependent on the initial norms. If a Finnish translator chooses to follow the norm of domesticating, they would most likely follow the operational norms of the Finnish text-type, not the foreign equivalent.

3.4.2 Norms of non-fiction translation

There are some norms that can be said to be characteristic of translating non-fiction. These include the norms of **specialist translators**, **readability and clarity over style**, and **accurate terminology**.

Montgomery (2000: 253) notes there is a deeply embedded belief in the society that the transfer of scientific discourse is an unimportant event, comparable to passing coins from one hand to another. This is by no means the truth, he continues: scientific discourse is not universal, but closely dependent on culture and language. Even mathematical texts, which are often considered the most universal expressions of science, take place in a linguistic context: equations and formulas are oftentimes accompanied by extensive written explanations and discussion (Montgomery 2000: 254).

According to Aho and Mänttari (2007a: 308), translators of non-fiction were relatively free to modify, omit or add sections of the source texts during the formative years of Finnish literature in the beginning of the 19th century. By the early 20th century this trend had reversed. By then, the main principles of what non-fiction translations should be like were generally agreed upon. For example, extensive modification of source texts was not generally allowed. Aho and Mänttari state that the principles of non-fiction translation of the early 20th century were similar to the ones we acknowledge nowadays.

By the early 20th century norms concerning correct language use were also well-established. Aho and Mänttari (2007a: 308) note that certain criticisms from 1889 reveal that although Finnish words were preferred, foreign words were starting to become accepted. By 1904 the language used in translations was already clearly modern Finnish, differences being mainly stylistic or rhetorical. By then foreign words were used extensively, especially when contrasted to the puristic tendency of the 19th century.

According to a study by Tirkkonen-Condit (1985: 12), the problems of translating argumentative texts are not related to linguistic proficiency, but difficulties in comprehension and interpretation of the source text. Similar difficulties can be found in all non-fiction, which is by definition focused on conveying information accurately. The translator has to be constantly on his toes to avoid distorting the argument, which requires a deep, profound understanding of the subject at hand. In other words, the translator has to thoroughly understand texts from highly specialized fields of expertise in order to successfully translate them.

Perhaps due to such research, the initial norm governing the choice of translator in non-fiction has changed. According to Aho and Mänttari (2007b: 565), translators of the past were often first and foremost translators who worked for the publishers. Being experts in matters of translations and language, they often lacked expertise in the subject matter of the translated text. Montgomery (2000: 305) notes that a scientific translator was expected to be able to work on any field necessary, ranging from applied physics to biology. Nowadays translators are more specialized: Montgomery (2000: 302) has noted that translators of non-fiction tend to specialize in a limited number of fields and utilize expert advisors more and more. The main reason for this seems to be the incredible pace at which technical terminology evolves, which makes it difficult for translators to translate from multiple fields of expertise simultaneously.

Jääskeläinen (2006: 240) notes that many contemporary translators of non-fiction – at least in Finland – are in fact primarily experts in the fields of science they are translating, not experts in translation. As noted by Paloposki and Riikonen (2013: 599), this is also reflected in translation criticism of translated non-fiction, which often focuses on term choices and the role of expertise in translating. I have called this the **norm of specialist translators**. Some might argue that favouring specialists of the field instead of professional translations may result in clumsier translation, since the translators are no longer exclusively experts of language and communication. While this may hold some truth to it, Aho and Mänttari (2007b: 565) also remind that the opposite has been known

to happen: sometimes a translator has been known to have lots of goodwill while lacking the skills required to comprehend the source text. Moreover, even though these ‘specialist translators’ do not necessarily have formal education in translation, it does not mean that they are not qualified or competent enough to translate.

This tendency for specialization does not limit itself to translators. All active agents in the field of non-fiction, such as translation agencies and publishing houses, seem to be affected, albeit to varying degrees. Montgomery (2000: 302) writes that there are entire translation agencies focused on one specific field of expertise, such as biomedicine. Furthermore, Toury (2004: 209) states that publishing houses with a focus on non-fiction as opposed to general publishing are becoming more common. This is noticeable in Finland, too: some small publishing houses such as *Gaudeamus*, *Vastapaino* and *Terra Cognita* have specialized in scientific publishing. This demand for specialization is related to changes in the preliminary norm of **translation policy**.

Leikola (2013: 429) has noted that conserving the original writer’s style is not usually considered important when translating works of natural sciences; a stance that is strictly opposite to the way translations of literature are commonly treated. Modern-day norms allow toning down stylistic or idiosyncratic language use in translations of non-fiction in order to improve the **readability and clarity of information**, which are valued over style (ibid.). The same idea is presented by Helin (2005: 159), who states that the accuracy of the target text can be deemed more important than the identity of the text. Riikonen (2000: 56) agrees, although he notes there are exceptions to the rule: English translations of Freud’s works by James Strache, for example, have been called more scientific or objective in style. Riikonen further adds that Finnish translation criticism of non-fiction has traditionally focused on terminology and scientific accuracy.

Korpela (2004: 7.3) maintains that the purpose of a translation of non-fiction is to express the content and meaning of the original as clearly as possible in the target language, without omissions or changes. However, works which are considered classics in their field – such as *Origin of the Species* – can be treated differently (Leikola 2013). Therefore it is reasonable to expect that Darwin’s distinctive style of writing might be treated more conservatively than other scientists’ during the process of translation.

However, the notion of ‘clarity of information’ is not as straightforward as it might initially seem. Mäntynen (2012: 387–388) notes that a translator of non-fiction is torn to different directions: on one hand, his choices have to be **faithful to the source text**, but on the other hand also abide by the

conventional discourse of the target language scientific field. In other words, the conventions of Finnish non-fiction have to be followed. According to Mäntynen, it is quite common for many people to be involved in the translation process: in addition to the translator and the publishing editor, specialists in the field may be consulted. The final translation solutions are the result of negotiations between these different experts, all of whom bring their own language ideologies to the table.

On a textual level, word choices are to be as **unambiguous as possible, with a focus on precise terminology**. However, Korpela (2004: 7.3) also writes that apparent terminological precision can hinder understanding depending on the target audience. The translator should always take the reader into account in word or term choices. According to Korpela (*ibid.*), it is often better to use comprehensible words in conjunction with syntactically complex expressions, even if it requires sacrificing the syntax of the source text. Nevertheless, it is generally acknowledged that terminology in non-fiction should be as accurate as possible.

3.4.3 Studying norms of translation

So far we have defined what a norm is, talked about their formation, introduced categorizations, as well as given some examples of norms. However, we have not yet discussed how norms are studied. This section will present different ways of studying norms based on the works of Toury and Chesterman.

Toury (2012: 87) states that we can see effects of norms in the production of translations. However, in doing so we are not witnessing the norms themselves, merely *instances of norm-governed behavior*, or the end-products of norms. In other words, we see the result of norms, which affected the translator at the time of translation. In order to get a clear picture of the actual norm itself, we have to reconstruct it (Toury 2012: 88). This can be achieved by using data from either *textual* or *extratextual* sources. Textual sources include the translations themselves. In Toury's words these are the *primary products* of translation norms. Extratextual sources, on the other hand, include semi-theoretical or critical formulations of norms, statements by different agents involved in the translation process, translation commentaries, criticisms, and so on. These Toury calls the *by-products* of the existence of norms. Toury is sceptical about extratextual sources, and advises us “**never to take normative pronouncements at face-value**” (Toury 2012: 88, emphasis in the original), as they can be partial, biased or even deliberately misleading. Chesterman (1997: 57) does

not share the same scepticism, pointing out that norms are partly validated by normative pronouncements by norm authorities, partly by their very existence.

Toury (2012: 89) suggests we should study both textual and extra-textual sources in order to get a clear, coherent picture of a norm. To do this, we must examine the translation and look for patterns of translational behaviour, from which we can attempt to reconstruct a norm. After reconstructing a norm from patterns emerging from the text, we may compare the reconstructed norm to normative pronouncements found in extratextual sources. If we can show that there exists a clear connection between the patterns emerging from the translation and normative pronouncements found in extratextual sources, the normative pronouncement gains credibility. With that being said, Toury has no answer to the question of how often a pattern has to occur in order to be considered regular: the only rule of thumb he offers is “the bigger – the better” (Toury 2012: 81). He also reminds that a translator cannot be expected to remain completely systematic throughout a translation, as his motivation and decision-making can be unevenly distributed throughout the text (Toury 2012: 89).

Toury comments on a statistical model for studying norms, developed by sociologist Jackson (1960). Jackson’s model is based on measuring the ratio between the intensity and tolerance towards a certain norm. However, Toury seems sceptical about adopting Jackson’s rigorous, distribution-based model for the study of translation norms. Instead, he suggests we should be content with our intuition, which allows us to make ‘educated guesses’ about norms based on past experience and knowledge.

In addition to the ways of studying norms suggested by Toury, Chesterman (1997: 81) draws attention to the use of parallel corpora in norm research. Parallel corpora enable us to examine and contrast translations to original texts. Parallel corpora allow, for example, the comparison of Finnish translations of English user manuals to user manuals written originally in Finnish. This in turn makes it possible to determine whether the two categories of texts differ from each other in terms of lexical density, lexical variety, word length, or any other conceivable textual feature. This method is similar to the one used in the present study, although I have not used the word corpus to refer to my material.

4 Research material and method

Section 4.1 below introduces the research material of the present study. The research method of the present study is a combination of two methods: a quantitative, statistical analysis, described in section 4.2, combined with a qualitative textual analysis of the source material, described in section 4.3. Because of this twofold division, the analysis is likewise presented in two sections.

As pointed out by both Toury (2012: 88–89) and Chesterman (2007: 363), a normative pronouncement is not a prerequisite to the study of norms. It is also possible to start by searching for recurring patterns in the research material, trying to find out whether there could be an underlying norm behind the patterns. This point of view is also the basis of the research method of this study: I have tried to uncover recurring patterns in the translations by comparing TT1 and TT2 to each other using both statistical and text analytical methods. The patterns emerging from the translations will then be compared to and contrasted with normative pronouncements found in extratextual sources.

4.1 Research material

The research material of the present study consist of two Finnish translations of Charles Darwin's *On the Origin of the Species*, which was originally published in 1859. A total of six editions were published, in which Darwin answered criticism of previous versions and updated the content based on new research (Ranta 2009: 420). The book is considered to be a major landmark of evolutionary biology, explaining the diversity of all life on earth. Darwin's ground-breaking idea of natural selection, first presented in this book, has since been adapted to various other fields of science, including economics, computer science, medicine and psychology. Translator Pertti Ranta (2009: 421) describes the work as "the book with the biggest influence on our world view", which remains relevant to this day. It was recently voted the most influential academic book in history by the British newspaper *The Guardian* (Flood: 2012).

The translations used in this study are the 1st edition of the first Finnish translation from 1913–1917 by A.R. Koskimies, and the latest, most up-to-date version from 2009 by Pertti Ranta. The latest edition of the first translation was published in 1988, but since this study aims to examine how the genre and norms of Finnish scientific writing have changed over the last century, the first edition was chosen for the analysis. The newest translation from 2009 was retranslated in celebration of the

200th anniversary of Darwin's birth, as well as the 150th anniversary of the publication of the first edition.

Because of the limited scope of this Master's thesis, the two translations could not be analysed in their entirety. In order to narrow down the material, I initially planned to excerpt the same passage from both translations. I selected chapter IV of the book for analysis, since it introduces the concept of natural selection, which later became to be known as the centerpiece of Darwin's thought and is therefore of great importance.

However, it was quickly discovered that gathering the material would not be as straightforward as expected. During the first phase of gathering material it became evident that the translations are not based on the same source text: the older Finnish translation from 1913–1917 is based on the 6th and final edition of the English source text, published in 1872, whereas the newer translation from 2009 is based on the very first edition, published in 1859. As it turns out, the two editions are quite dissimilar: the first edition is roughly 170,000 words long, while the 6th edition is almost a third longer with over 200,000 words. After further investigation it became clear that the two editions differ quite substantially throughout the text, not only in certain sections. According to Wyhe (2002), every section of the book has undergone some sort of editing throughout the various editions.

Although a major setback, this was by no means an insurmountable problem. The obstacle was overcome by finding out which parts of the 6th edition were unaffected by editing, i.e. remained exactly the same as in the 1st edition. After acquiring the two editions of the source text in a digital format, both texts were compared to each other electronically in order to locate sections that had gone unaltered throughout the various editions. Wyhe (2002) also offers a variorum of *Origin of the Species*, but the user interface and features proved inadequate for the purposes of this study.

As previously stated, the paragraphs that would be included in the research material were chosen by scrolling through the compared editions in Microsoft Word. It was clear that Darwin had edited the text quite heavily throughout the entire book, but luckily there was enough overlap between the two editions to gather enough material for the purposes of this study. The final research material consists of roughly 3,500 words of English source text and the equivalent sections of the Finnish translations (2,592 and 2,213 words long), which were typed into plain text format. All three texts were proofread to ensure they contained no typos. The research material can be found in Appendix 1 (for TT1) and Appendix 2 (for TT2).

The main focus of this study is to examine how Finnish translations of non-fiction have changed in the last hundred years. This is done by examining the distribution of various different textual features, as well as a close reading and text analysis. For the sake of the validity of the study it was decided to only include sections of the text that could be viewed as coherent units. Including unconnected, loose sentences was therefore out of the question.

It is common for translators to break down sentences in order to make the target text flow better in the target language, but paragraphs are often treated as coherent wholes which should not be broken down. Following this reasoning I decided to limit the source material to paragraphs which had remained unchanged between the different editions. In an ideal situation the source material would have been one continuous passage, but unfortunately it proved impossible in this case. Instead of abandoning the research subject, it was deemed that the advantages of studying *The Origin of the Species* outweigh the disadvantages that would result from dividing the text into smaller excerpts. It is also worth noting that the excerpts only include full sentences from the body text, excluding headings, subheadings, introductory keyword lists, and the like.

4.2 Quantitative method

The quantitative research method of the present study is a statistical analysis conducted on selected sections of the two translations (from now on referred to as TT1 and TT2), both of which have been annotated using a functional descriptive grammar annotation software Connexor FDG provided by the Language Bank of Finland. The software tags the text with metadata about its syntactical and morphological features, such as syntactical dependency, word class, inflection, and so forth. The quantitative analysis attempts to uncover statistically significant differences in the distribution of various textual features between the two translations. The hypothesis is that there are significant differences between the two translations which can be explained by changes in the norms of translating non-fiction. The results will be analysed using a spreadsheet software, which allows us to examine and illustrate differences between the two translations, ranging all the way from sentence-level to single morphemes. A more in-depth description of the features to be analysed is included in Section 5 and its subsections.

In some cases, for example when comparing the accuracy of terminology between TT1 and TT2, the source text (ST) excerpts have been consulted. Nevertheless, the main focus is not on the source text or the two translations' relation to it, but on differences between the two translations. The same excerpts are used as material for both quantitative and qualitative analysis.

4.3 Qualitative method

As stated in the previous section, the first part of the analysis is based on statistical data gathered from both source texts. However, it is important to remember that a statistical analysis, no matter how meticulously conducted, only offers one rather mechanical point of view into the source material. This is especially true in matters of language and translation. As Vehmas-Lehto (2011: 32) has said, it is not worthwhile to base translation research solely on quantitative information. Because of this, the quantitative method of the study will be accompanied by a qualitative method.

The main reason for including a qualitative method is that the method of statistical analysis does not take into account the semantic content of the excerpts. The quantitative method is, in a way, blind to meaning, only focusing on the distribution of morphological categories. This shortcoming will hopefully be overcome in the qualitative section of the analysis. The research method is based on close reading and text analysis, and has a twofold purpose. First, it allows us to examine changes in the semantic content of the translations, such as possible omissions, additions or changes in meaning. Second, the qualitative method allows us to take another point of view at the findings of the quantitative method. If the quantitative method reveals that there are significant differences in the distribution of certain textual elements between TT1 and TT2, the qualitative analysis will reveal whether the same differences are noticeable in a qualitative reading as well.

The qualitative analysis is not based on a single pre-existing theory or categorization of norms. Instead, it will take into account previous research and writings on norms of translation and non-fiction. I will attempt to compare my findings to previous research, and see whether my findings can be attributed to norms found in other sources.

5 Analysis

The analysis section of the present study will be divided into two subsections: section 5.1 is quantitative, followed by section 5.2 which is qualitative. The basic premise of this study is that both translations reflect the translation norms of their time. The aim of the quantitative analysis is to uncover textual regularities, which will be explained in more detail in the qualitative section. Hopefully at least some of the differences can be reasonably explained by changes in the norms of non-fiction translation.

The purpose of the quantitative section is to provide numerical data about the distribution of various textual features of both translations. This section will include a thorough statistical analysis concerning word classes and morphology of the source material, i.e. TT1 and TT2. This quantitative analysis aims to reveal how the two translations differ from each other in terms of distribution of textual features. The data is accompanied by textual examples from the texts when deemed necessary. However, the primary function of the quantitative section is to start the process of norm reconstruction by looking for patterns of translational behavior (see section 3.4.3).

There is one major shortcoming in the quantitative method: it is incapable of revealing semantic differences between the texts. The purpose of the qualitative section is to address these shortcomings by finding the parts where the semantic content of the two translations differ, such as the parts where something has been changed or left out of TT1 or TT2. Including a qualitative section was necessary to give a clear, thorough picture of the text in its entirety, hopefully explaining some of the differences. Although the results of the quantitative section may appear to go unexplained, they will be returned to later in section 5.2, which includes more textual examples and explanatory analysis. The full context for each example can be found in the Appendices.

5.1 Quantitative analysis

The quantitative analysis is divided into subsections based on the different textual classes being examined. Subsections 5.1.1 through 5.1.5 include the quantitative analysis of chosen word classes and their textual features, such as verb tense and noun case. Subsections 5.1.6 and 5.1.7 concern clitics and possessive suffixes, which are morphemes that are dependent on other words. Subsection 5.1.8 looks into word and sentence length. All data is based on the results obtained using an annotation software provided by the Language Bank of Finland. The results have not been manually checked for errors due to the vast amount of data.

Because the two translations were of different lengths, all results in the analysis have been normalized and given as percentages to make them comparable. All chi-square tests use Yates' correction. When the differences in the results of the statistical analysis were non-existent or minuscule, no chi-square test was conducted.

Table 1 and Figure 1 below illustrate the total distribution of all word classes in TT1 and TT2.

Table 1: Distribution of word classes in TT1 and TT2

Word class	TT1	TT1 %	TT2	TT2 %
Adjective	309	12.3%	282	12.9%
Adverbial	274	10.9%	255	11.7%
Auxiliary V	60	2.4%	46	2.1%
Conjunction	221	8.8%	200	9.2%
Noun	700	27.8%	661	30.3%
Numeral	37	1.5%	31	1.4%
Adposition	47	1.9%	39	1.8%
Pronoun	301	11.9%	222	10.2%
Verb	572	22.7%	446	20.4%
Total	2521	100.0%	2182	100.0%

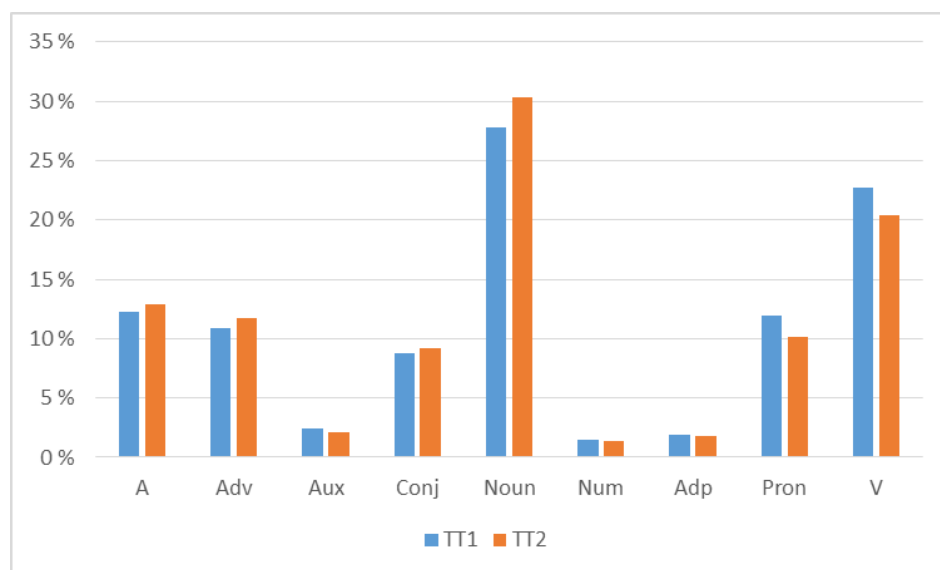


Figure 1: Distribution of word classes in TT1 and TT2

It is clear that both translations follow the same pattern when it comes to their word class distribution. There does not seem to be any major difference between the two texts. This was to be expected, as we are still examining the text on a relatively superficial level: major differences at this stage would have been unexpected, to say the least. However, the two translations do differ from

each other, albeit only slightly. TT2 seems to be slightly favouring nouns and adverbials, while TT1 favours pronouns and verbs. It is worth reminding that both translations are based on the exact same source text, which means that these differences, however small they may be, are results of translational choices.

5.1.1 Verbs

This category includes everything related to both main verbs and auxiliary verbs. Table 2 below illustrates the distribution of main and auxiliary verbs in TT1 and TT2.

Table 2: Distribution of verb types Aux and Main in TT1 and TT2

Verb type	TT1	TT1 %	TT2	TT2 %
Aux	60	9.5%	46	9.3%
Main	572	90.5%	446	90.7%
Total	632	100.0%	492	100.0%

As Table 2 above illustrates quite clearly, there does not seem to be any significant difference in the use of main verbs or auxiliary verbs in the two translations. Main verbs are the most prevalent class in both TT1 and TT2, with roughly a tenth of all verbs being auxiliary verbs. The translations have to be analysed more closely to gain meaningful results. We will now turn our attention to differences in grammatical features of verbs: **grammatical voice**, **grammatical mood**, **grammatical tense**, **infinitive forms**, and **person**.

Grammatical voice gives information about the person acting or being acted upon. It can have two values: active or passive. Active voice shows the agent, whereas passive voice does not. The distribution of active and passive voice in TT1 and TT2 is illustrated in Table 3 below.

Table 3: Distribution of grammatical voice

Voice	TT1	TT1 %	TT2	TT2 %
Act	551	87.2%	429	87.2%
Pass	81	12.8%	63	12.8%
Total	632	100.0%	492	100.0%

Once again it seems that the difference is strikingly nonexistent. Both translations are practically uniform in their use of grammatical voice.

Iso Suomen Kielioppi (VISK: §115) describes **grammatical mood** as a grammatical feature of verbs (excluding infinitives and participles) that expresses attitude. Grammatical mood can have

four categories in Finnish: indicative, imperative, potential and conditional. Their distribution is illustrated in Table 4 below.

Table 4: Distribution of grammatical mood in TT1 and TT2

Mood	TT1	TT1 %	TT2	TT2 %
IND	245	83.6%	214	87.0 %
IMP	13	4.4%	4	1.6%
POT	3	1.0%	0	0.0%
CND	32	10.9%	28	11.4%
Total	293	100.0%	246	100.0%

Grammatical mood, too, seems to be following the same trend in both translations. The biggest differences are between indicative and imperative: It seems that TT1 slightly favours imperative, while TT2 avoids it. On the other hand, TT2 favours indicative more than TT1. Potential verb form does not occur at all in TT2. Differences in the results are nonsignificant ($\chi^2(3, N = 741) = 7.60, p = 0.108 > 0.05$).

According to *Iso Suomen Kielioppi* (VISK: §112), **grammatical tense** is a deictic category that expresses the temporal relation between the moment of speaking and the thing being spoken of. Finnish language has four grammatical tenses: present, imperfect, perfect and past perfect, which is also known as pluperfect. Their distribution is illustrated in Table 5 and Figure 2 below.

Table 5: Distribution of grammatical tenses in TT1 and TT2

Tense	TT1	TT1 %	TT2	TT2 %
PRES	213	50.8%	187	58.1%
PAST	52	12.4%	47	14.6%
PCP PRE	68	16.2%	36	11.2%
PCP PAST	86	20.5%	52	16.1%
Total	419	100.0 %	322	100.0 %

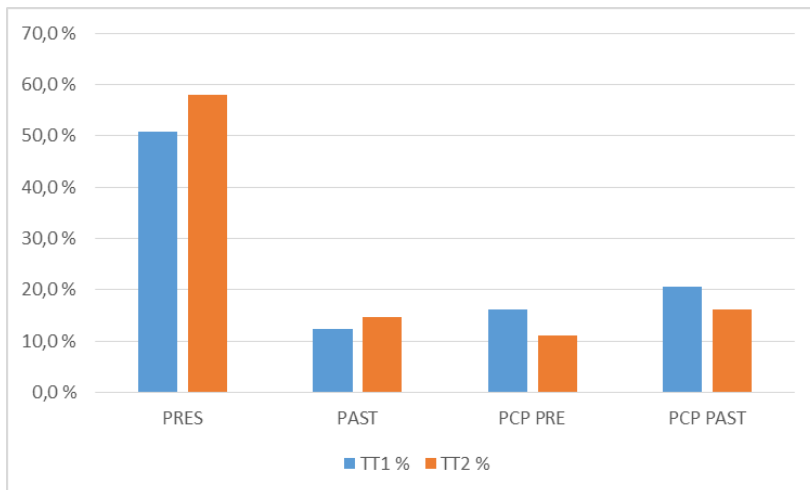


Figure 2: Distribution of grammatical tense in TT1 and TT2

It is clear that there are some differences between TT1 and TT2 in their use of verb tenses: TT1 favours present participle and past participle, which are by default heavier structures than present and past tense, which in turn are favoured by TT2. Performing a chi-square test on grammatical tenses, however, results in $\chi^2(3, N = 741) = 7.60, p = 0.055 > 0.05$. The result is therefore not quite significant.

We will next look at the usage of **infinitive forms**. According to VISK (§119), Finnish has three infinitive verb forms: *-A*, *-E*, and *-mA*. Infinitives are verb forms that inflect partly like nominals. The annotation software, however, recognizes four different infinitives. The so-called fourth infinitive (not considered infinitive by VISK) is extremely rare in Finnish: it is mainly used in certain old expressions or idioms, such as *käy käymistään* and *ui uimistaan* (FinnLectura). Some examples of fourth infinitive were initially found from the source material, but after closer inspection it became clear this was due to an error in the annotation process. The annotation software is unable to differentiate between fourth infinitive forms and action nouns formed using inflection *-minen*, such as *meneminen* and *rakentaminen*. It turned out the hits for fourth inflection were, in fact, mistakenly tagged action nouns. After noticing this error, the mistakenly tagged fourth infinitive forms were excluded from the analysis.

After excluding the mistakenly tagged fourth infinitive form from the analysis, INF1, INF2 and INF3 were analysed. Their distribution is illustrated in table 6 below.

Table 6: Distribution of infinitive forms in TT1 and TT2

Infinitives	TT1	TT1 %	TT2	TT2 %
INF 1	53	45.3 %	46	51.7 %
INF 2	36	30.8 %	13	14.6 %
INF 3	28	23.9 %	30	33.7 %
Total	117	100.0 %	89	100.0 %

Performing a chi-square test resulted in χ^2 (2, N = 206) = 7.69, p = 0.021 < 0.05 which is a significant result. This result will be returned to in section 5.2.1.

The results are clear: there are certain major differences in the distribution of infinitive forms. First infinitive forms, such as *sanoa* and *tullakseen*, are the most prevalent infinitive form in both TT1 and TT2. Second infinitive forms, such as *sattuessa*, *kuluessa* and *pitäen* are used over twice as often in TT1 compared to TT2. TT2, on the other hand, favours third infinitive structures, such as *kokemaan* and *jyrsimättä*.

Verbs inflect for **person** by adding personal suffixes to the end of a conjugated verb to signal relations between referential noun phrases (VISK: §107). Due to personal inflections, personal pronouns are not necessary in first and second person (FinnTreeBank2 Manual: 16). Table 7 and Figure 3 below illustrate the distribution of person in TT1 and TT2.

Table 7: Distribution of person of verbs in TT1 and TT2

Person	TT1	TT1 %	TT2	TT2 %
SG1	27	9.5%	27	11.6%
SG2	4	1.4%	4	1.7%
SG3	136	47.7%	132	56.7%
PL1	25	8.8%	0	0.0%
PL2	3	1.1%	0	0.0%
PL3	90	31.6%	70	30.0%
Total	285	100.0%	233	100.0%

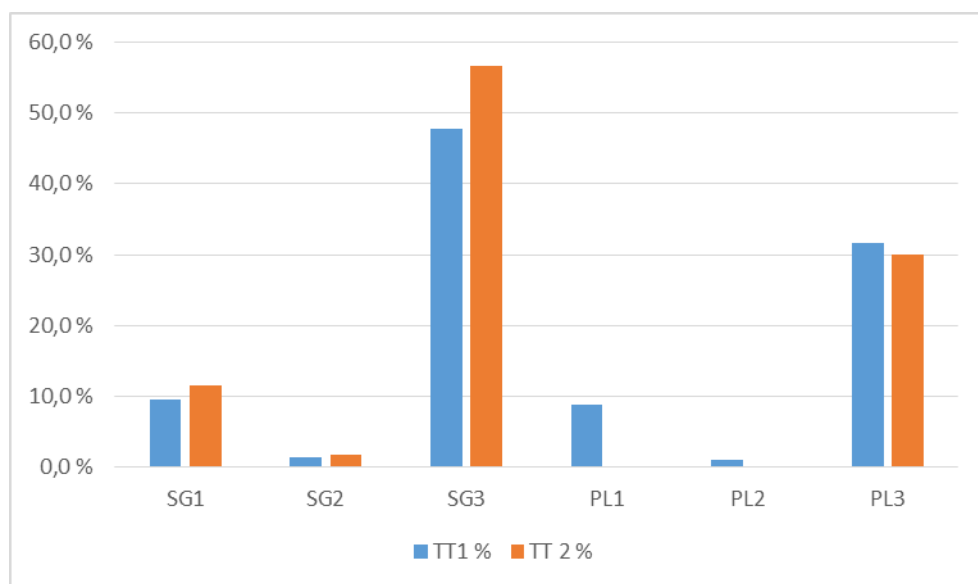


Figure 3: Distribution of person of verbs in TT1 and TT2

Third person singular and third person plural are by far the most common persons. Performing a chi-square test gives χ^2 (5, N = 518) = 25.60, $p = 0.0001 < 0.05$. The result is significant: there are statistically significant differences in the use of person of verbs between TT1 and TT2. Perhaps the most interesting finding in terms of person is the difference between third person singular (SG3) and first person plural (PL1): TT2 favoured SG3 forms such as *kannattaa*, *tapahtuu*, and *tuottaa*, while avoiding PL1 completely. TT1, on the other hand, used PL1 forms such as *näemme*, *muistelkaamme* or *mietimme*, which bring the text closer to the reader, giving the older translation a warmer tone when compared to TT2. This result will be analysed in more detail in section 5.2.4.

5.1.2 Nouns

Nouns are the largest category of nominals in TT1 and TT2, making up approximately 30 percent of the total vocabulary of both translations. Frequency of nouns was higher in TT2, which may be a sign of decreased readability as shown by previous research (see Vehmas-Lehto 2011: 42). Nouns were analysed in terms of their number, grammatical case and the division of nouns and proper nouns. Table 8 below illustrates the distribution of plural and singular number in nouns.

Table 8: Distribution of plural and singular nouns in TT1 and TT2

Number	TT1	TT1 %	TT2	TT2 %
SG	420	60.9%	388	60.0%
PL	270	39.1%	259	40.0%
Total	690	100.0%	647	100.0%

In terms of singular and plural nouns, there is no significant difference between the two translations. In fact, the amount of singular and plural forms in nouns is within 0.9 percentile of the usage in nominals in general.

Noun cases express the relationship between nouns and other grammatical components of the sentence. There are fifteen cases in Finnish. The distribution of noun cases in TT1 and TT2 is illustrated in Table 9 and Figure 4 below.

Table 9: Distribution of grammatical cases in nouns

Noun cases	TT1	TT1 %	TT2	TT2 %
Nom	132	19.1%	130	20.1%
Ptv	132	19.1%	127	19.6%
Gen	205	29.7%	200	30.9%
Acc	0	0.0%	0	0.0%
Ine	44	6.4%	47	7.3%
Ela	44	6.4%	31	4.8%
Ill	44	6.4%	36	5.6%
Ade	25	3.6%	30	4.6%
Abl	18	2.6%	13	2.0%
All	10	1.4%	7	1.1%
Ess	18	2.6%	12	1.9%
Tra	9	1.3%	14	2.2%
Abe	5	0.7%	0	0.0%
Com	0	0.0%	0	0.0%
Ins	4	0.6%	0	0.0%
Total	690	100.0%	647	100.0%

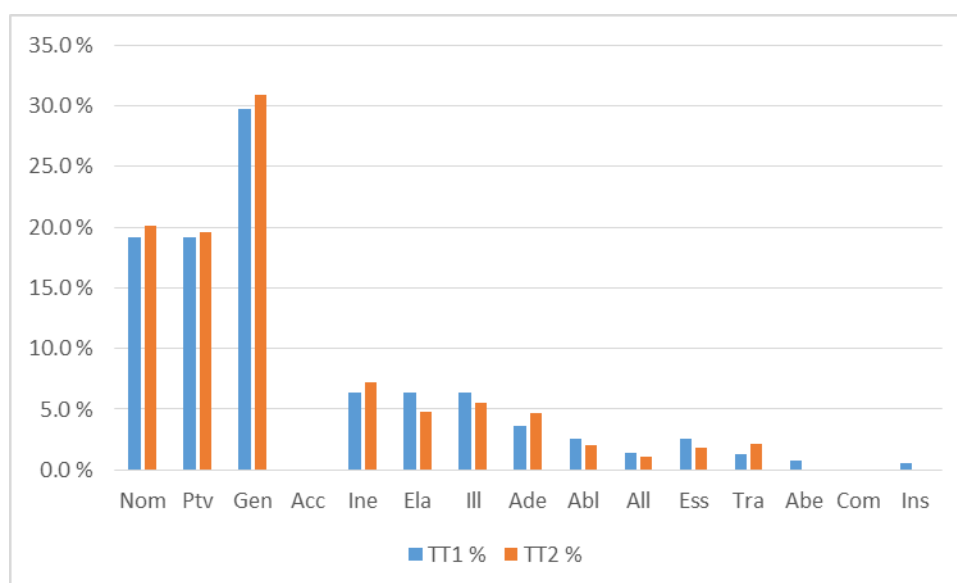


Figure 4: Distribution of grammatical case in nouns

Nominative, partitive, and genitive were the most used cases in both translations. Accusative and comitative cases were not used in either translation. TT1 also used abessive and instructive cases, which were unused in TT2. It is worth noticing that there were two cases that were used in TT1 but not in TT2, while there was no case that was only used in TT2. In other words, TT1 shows a larger variance in the use of grammatical cases: although abessive and instructive were not used much, they were nevertheless used. The more homogenous case use of TT2 might be an example of the entrenchment of linguistic conventions within the genre of Finnish scientific writing.

Both TT1 and TT2 contained the exact same amount of **proper nouns**, 38. This was by no means an interesting result: one could assume that proper nouns would hold great meaning in a scientific text, including information such as citing other scientists, names of geographical locations, and so forth. Because the number of proper nouns was quite small, it was decided to take a closer look at the instances.

As expected, most of the proper nouns used in TT1 and TT2 were geographical locations such as *Afrikka*, *Tulimaa*, *Australia* and *Persia*. There were also names of other researchers, such as *Hubert*, *Smith* and *Watson*.

5.1.3 Adjectives

Adjectives can be analysed in terms of their grammatical case, grammatical number, and comparative and superlative forms. The distribution of grammatical number in adjectives is illustrated in Table 10 below.

Table 10: Distribution of adjective number in TT1 and TT2

Adj number	TT1	TT1 %	TT2	TT2 %
SG	159	54.8%	144	53.5%
PL	131	45.2%	125	46.5%
Total	290	100.0%	269	100.0%

As was the case with all nominals and nouns, the difference in grammatical number of adjectives seems almost nonexistent. Both translations have approximately equal percentages of singular and plural adjectives. The distribution of grammatical cases in adjectives is illustrated in Table 11 and Figure 5 below. Accusative, comitative and instructive cases were unused and therefore excluded from the table.

Table 11: Distribution of grammatical cases in adjectives, excluding accusative, comitative and instructive

Adj cases	TT1	TT1 %	TT2	TT2%
Nom	74	25.5%	66	24.5%
Ptv	69	23.8%	84	31.2%
Gen	70	24.1%	62	23.0%
Ine	13	4.5%	12	4.5%
Ela	14	4.8%	11	4.1%
Ill	8	2.8%	9	3.3%
Ade	9	3.1%	7	2.6%
Abl	5	1.7%	2	0.7%
All	5	1.7%	0	0.0%
Ess	13	4.5%	5	1.9%
Tra	9	3.1%	11	4.1%
Abe	1	0.3%	0	0.0%
Total	290	100.0%	269	100.0%

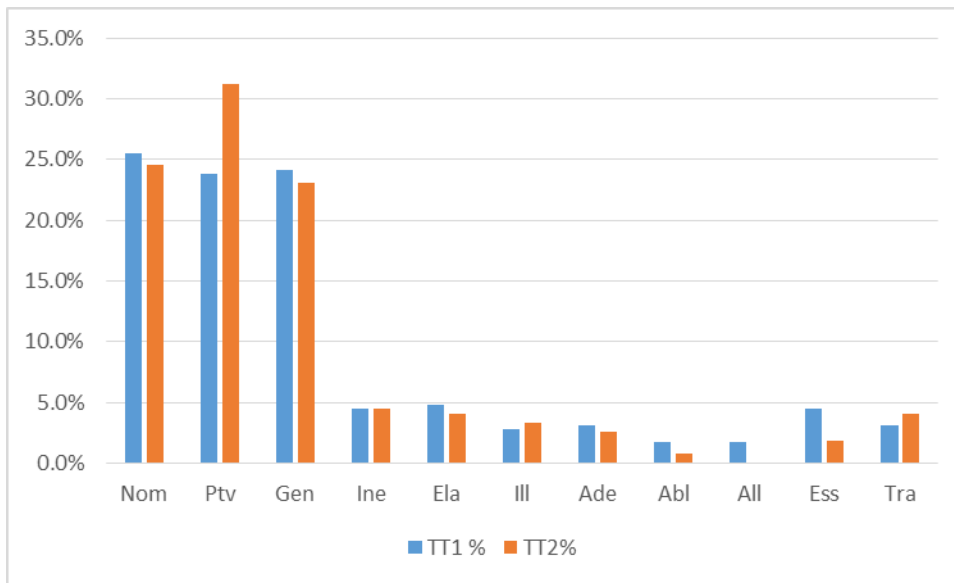


Figure 5: Distribution of grammatical cases in adjectives, excluding accusative, comitative and instructive

The first thing that one notices is the high proportion of partitive forms used in TT2.

Partitive form is used to express indefiniteness of various kinds (VISK: §1234). Examples of partitive adjective forms found in the research material include *pieniä*, *viimeaikaisia* and *polymorfisia*. Performing a chi-square test on adjective cases gives $\chi^2 (11, N = 559) = 13.39$, $p = 0.27 > 0.05$, which means the result is nonsignificant. Accusative, comitative and instructive cases were not included in the test, as they were not found in either text.

In addition to the high number of partitives in TT2, there were other minor differences between the two translations. TT1 was once again more varied in its choice of case: adessive, allative and abessive were used in TT1 but not in TT2. TT1 favours essive, while TT2 uses slightly more illative and translative.

Adjective comparison is illustrated in Table 12 below.

Table 12: Adjective comparison in TT1 and TT2

Comparison	TT1	TT1 %	TT2	TT2 %
CMP	22	68.8%	18	69.2%
SUP	10	31.3%	8	30.8%
Total	32	100.0%	26	100.0%

It is quite clear there is no significant difference between the use of comparative and superlative adjective forms in TT1 and TT2.

5.1.4 Pronouns

Pronouns can be divided into several subcategories based on their function. However, as some of the subcategories are quite rare, this analysis is limited to the most prevalent categories: **personal pronouns**, **demonstrative pronouns**, and **relative pronouns**. Declension of all pronouns will be analysed first.

Table 13 below illustrates the distribution of the grammatical number of pronouns.

Table 13: Distribution of grammatical number of pronouns in TT1 and TT2

Number	TT1	TT1 %	TT2	TT2 %
SG	167	58.2%	120	56.3%
PL	120	41.8%	93	43.7%
Total	287	100.0%	213	100.0%

Once again, the difference in grammatical number seems to be almost nonexistent. It seems that grammatical number might be a feature that tends to go unchanged in translation.

Table 14 and Figure 6 below illustrate the distribution of grammatical case of pronouns.

Table 14: Distribution of pronoun case in TT1 and TT2, excluding accusative, abessive and comitative

Pron case	TT1	TT1 %	TT2	TT2 %
Nom	96	32.0%	76	34.7%
Ptv	49	16.3%	45	20.5%
Gen	70	23.3%	43	19.6%
Ine	14	4.7%	16	7.3%
Ela	16	5.3%	15	6.8%
Ill	9	3.0%	7	3.2%
Ade	21	7.0%	5	2.3%
Abl	2	0.7%	2	0.9%
All	13	4.3%	5	2.3%
Ess	4	1.3%	0	0.0%
Tra	4	1.3%	4	1.8%
Ins	2	0.7%	1	0.5%
Total	300	100.0%	219	100.0%

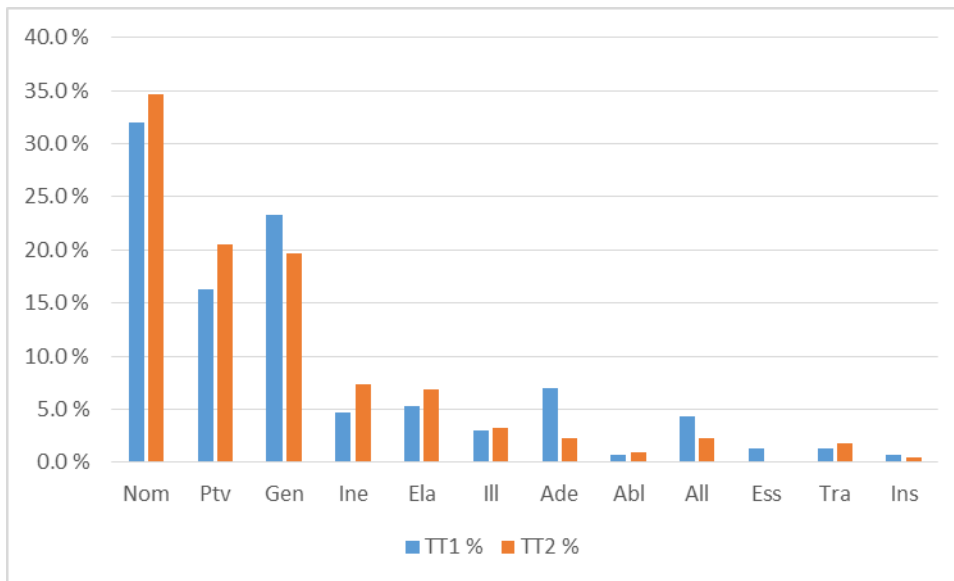


Figure 6: Distribution of pronoun case in TT1 and TT2, excluding accusative, abessive and comitative

As Figure 6 above shows, there are differences between the pronoun cases of TT1 and TT2. Nominative is the most common case in both translations, but the two other major categories partitive and genitive differ greatly. TT1 seems to favour genitive, while TT2 favours partitive, as well as inessive and elative.

When it comes to overall variance in the use of pronoun cases, TT1 and TT2 are on the same line. Performing a chi-square test gives χ^2 (11, N = 519) = 14.81, $p = 0.19 > 0.05$. The result is nonsignificant. There is no significant difference in the average declension of pronouns between TT1 and TT2.

The first category of pronouns to be analysed in more detail is **personal pronouns**. The distribution of personal pronouns in TT1 and TT2 is illustrated in Table 15 below.

Table 15: Distribution of personal pronouns in TT1 and TT2, excluding SG2 (sinä) and PL2 (te)

Personal	TT1	TT1 %	TT2	TT2 %
SG 1 (minä)	4	16.7%	3	30.0%
SG 3 (hän)	6	25.0%	4	40.0%
PL 1 (me)	8	33.3%	1	10.0%
PL 3 (he)	6	25.0%	2	20.0%
Total	24	100.0%	10	100.0%

Although the sample size is small, there is something to take note of here. TT1 has over twice as many personal pronouns than TT2, which means that TT2 has either completely omitted the

pronouns (and person) from the text or chosen to convey persona by other means, such as verb inflection. PL1 and PL3 have gone through the largest decline. Performing a chi-square test gives χ^2 (3, N = 32) = 2.67, $p = 0.44 > 0.05$. The result is therefore nonsignificant. This result will be returned to in section 5.2.4.

The second category to be analysed is **demonstrative pronouns**. The distribution of demonstrative pronouns is illustrated in Table 16 below.

Table 16: Distribution of demonstrative pronouns in TT1 and TT2.

Demonstrative	TT1	TT1%	TT2	TT2%
tämä	28	24.6%	13	14.8%
tuo	1	0.9%	1	1.1%
se	47	41.2%	36	40.9%
nämä	13	11.4%	8	9.1%
nuo	1	0.9%	0	0.0%
ne	24	21.1%	30	34.1%
Total	114	100.0%	88	100.0%

TT1 clearly favours pronoun *tämä*, which can Performing a chi-square test gives χ^2 (5, N = 202) = 6.57, $p = 0.26 > 0.05$. The result is nonsignificant.

The third category is **relative pronouns**, which are used to indicate the beginning of a relative clause. Finnish has two relative pronouns: *joka* and *mikä*. Genrally speaking *joka* refers to the preceding noun, whereas *mikä* refers to the entire preceding clause or a complete idea (VISK: §735). The distribution of relative pronouns is illustrated in Table 17 below.

Table 17: Distribution of relative pronouns in TT1 and TT2.

Relative	TT1	TT1%	TT2	TT2%
joka	45	80.4%	26	65.0%
mikä	11	19.6%	14	35.0%
Total	56	100.0%	40	100.0%

The first thing to notice is that the overall number of relative pronouns is higher in TT1 than in TT2. It also seems that TT1 favours *joka* quite heavily. From this result we can infer that TT1 has more relative clauses than TT2. This result will be discussed in more detail in the qualitative section of the present study. Performing a chi-square test gives χ^2 (1, N = 96) = 2.12, $p = 0.14 > 0.05$. The result is nonsignificant.

5.1.5 Conjunctions

Conjunctions are divided into two categories: coordinating conjunctions (CC) and subordinating conjunctions (CS). The distribution of the two categories is illustrated in Table 18 below.

Table 18: Distribution of CC and CS in TT1 and TT2

Type	TT1	TT1 %	TT2	TT2 %
CC	125	56.6%	123	61.5%
CS	96	43.4%	77	38.5%
Total	221	100.0%	200	100.0%

There are slight differences in the use of conjunctions between the two translations. Performing a chi-square test gives $\chi^2(1, N = 421) = 0.86, p = 0.35 > 0.05$. The result is nonsignificant. It seems that TT2 uses more coordinating conjunctions, such as *ja* and *mutta*, and less subordinating conjunctions, such as *että* and *kun*. It can be argued that this might be a sign of easier readability: coordination can be seen as a textual strategy which connects two or more syntactically same level entities by drawing attention to their similarity (VISK: §1080), whereas subordination connects two or more dependent clauses to each other (VISK: §883). In other words, coordinating conjunctions connect independent clauses that can be understood on their own, whereas subordinating clauses require the main clause to be comprehensible. It can be argued that favouring coordinating sentence structures makes for more readable text, whereas favouring subordinate sentences makes the text syntactically more complex.

Subordinating conjunctions signal the beginning of a subordinating clause, which are dependent of main clauses (VISK: §883). The function of a subordinating clause is to give additional information about the content of the main clause.

There are 24 different conjunctions used in TT1 and TT2, but since some of them are only used a few times, the analysis is limited to the most used ones. These can further be categorized into two subcategories: coordinating conjunctions *että*, *kuin* and *vaikka*, and subordinating conjunctions *ja*, *jos*, *kun*, *mutta* and *tai*. The distribution of the first category, coordinating conjunctions, is illustrated in Table 19 below.

Table 19: Distribution of most common coordinating conjunctions in TT1 and TT2.

Coord	TT1	TT1 %	TT2	TT2 %
että	34	58.6%	21	48.8%
kuin	19	32.8%	17	39.5%
vaikka	5	8.6%	5	11.6%
Total	58	100.0%	43	100.0%

It is clear that TT1 and TT2 are close to each other in respect to their use of coordinating conjunctions. The most notable differences are the high number of *että* in TT1. *Että* is a conjunction that has no meaning on its own; it is often used to separate two clauses from each other (VISK: §819). Performing a chi-square test on coordinating conjunctions gives $\chi^2 (2, N = 101) = 0.98$, $p = 0.61 > 0.05$. The result is nonsignificant.

Table 20 below illustrates the distribution of the second category, subordinating conjunctions.

Table 20: Distribution of most common subordinating conjunctions in TT1 and TT2.

Subord	TT1	TT1 %	TT2	TT2 %
ja	76	57.1%	70	51.9%
jos	13	9.8%	10	7.4%
kun	12	9.0%	14	10.4%
mutta	9	6.8%	14	10.4%
tai	23	17.3%	27	20.0%
Total	133	100.0%	135	100.0%

Once again, the differences are minor. The most notable differences are the higher number of *mutta* and *tai* in TT2. *Mutta* is contrasting by nature (VISK: §1103), whereas *tai* is disjunctive (VISK §1098). Performing a chi-square test on subordinating conjunctions gives $\chi^2 (4, N = 268) = 2.18$, $p = 0.82 > 0.05$. The result is nonsignificant.

All in all, there is no significant difference between the distribution of conjunctions in TT1 and TT2.

5.1.6 Clitics

This section concerns clitics, i.e. particles that attach to a host word and have distinct functions (VISK §126). There are a total of 7 clitics in Finnish: -kO, -kA, -kin, -kAAAn, -pA, -hAn, and -s. The distribution of clitics is illustrated in Table 21 below.

Table 21: Distribution of clitics in TT1 and TT2

CLI	TT1	TT1 %	TT2	TT2 %
-kO	5	9.4%	6	25.0%
-kA	5	9.4%	3	12.5%
-kin	25	47.2%	11	45.8%
-kAAAn	12	22.6%	2	8.3%
-pA	5	9.4%	0	0.0%
-hAn	1	1.9%	2	8.3%
Total	53	100.0%	24	100.0%

As Table 21 above shows, there is some variation between TT1 and TT2 in their use of clitics. TT1 favours -kAAAn and -pA, while TT2 uses the -hAn and question clitic -kO more. Typical examples of uses are exemplified below.

Example 1

Jalostusta ei yleensä suin**kaan** saada aikaan eri rotujen ristisiitoksella. (TT1/2)

Viittaavat**ko** nämä mutkikkaat ja merkilliset säännöt siihen, että lajeilla olisi hedelmättömyys myötäsyttyisenä ominaisuutena yksinkertaisesti lajien sekaantumisen estämiseksi luonnossa? (TT2/16)

The number of -pA clitics is connected to TT1's tendency to favour imperative verb mood when addressing the reader, as shown below.

Example 2

Verratka**apa** englantilaista kirjekyyhkystä lyhytotsaiseen kuperkeikkakyyhkyseen (TT1/1)

Katsoka**apa** kuinka erilaisia ovat kaali-kasvin lehdet ja kuinka tavattoman yhtäläisiä kukat! (TT1/2)

Performing a chi-square test on all clitics gives $\chi^2(5, N = 77) = 8.84$, $p = 0.11 > 0.05$. There is no significant difference in the overall use of clitics between TT1 and TT2.

5.1.7 Possessive suffixes

Second person singular and plural possessive suffixes, such as *lintusi* and *lintunne* respectively, were unused in the source material. Third person singular and plural share the same form. Because of these reasons, the analysis of possessive suffixes is limited to the first and third person of possessive suffixes, such as *yllätykseni* and *kotieläintensä*. Table 22 below illustrates the distribution of possessive suffixes in TT1 and TT2.

Table 22: Distribution of possessive suffixes in TT1 and TT2.

Poss suff	TT1	TT1 %	TT2	TT2 %
Poss p1	19	26.0%	2	4.1%
Poss p3	54	74.0%	47	95.9%
Total	73	100%	49	100%

Performing a chi-square test on the possessive suffixes gives $\chi^2 (1, N = 122) = 8.42, p = 0.0037 < 0.05$, which is significant. In other words, TT1 and TT2 differ significantly in their use of possessive suffixes. Closer inspection reveals that TT1 has a tendency to utilize possessive first person suffixes with infinitive verbs forms such as *verratessamme* and *tarkastaessani*, which are more common in TT1 than in TT2. The vast majority of TT2's possessive suffix use is in third person, such as *siipiinsä*, and *toisistaan*. The prevalence of first person possessive suffixes in TT1 might be explained by the fact that infinitive verbs are common in non-finite clauses, which seem to be more prevalent in TT1 than TT2. This matter will be returned to in section 5.2.1.

5.1.8 Word and sentence length

This section compares the word and sentence lengths of TT1 and TT2. Figure 8 below illustrates the distribution of word lengths in TT1 and TT2.

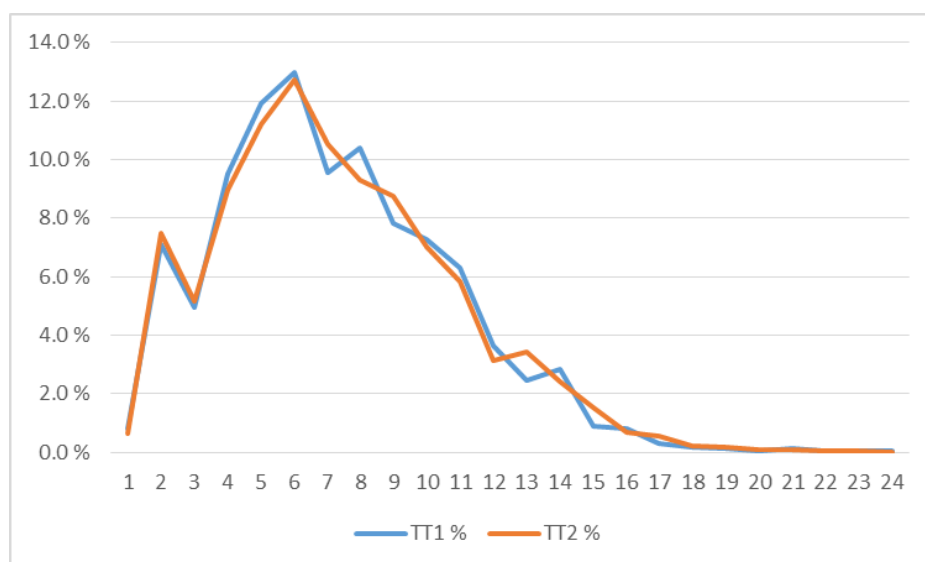


Figure 8: Distribution of word lengths in TT1 and TT2

There does not seem to be any remarkable difference between the word lengths of the two translations: the difference is nonsignificant. Performing a chi-square test on word length gives $\chi^2(23, N = 268) = 15.36, p = 0.88 > 0.05$. The result is nonsignificant.

Sentence length is a whole different matter, as illustrated by Figure 9 below.

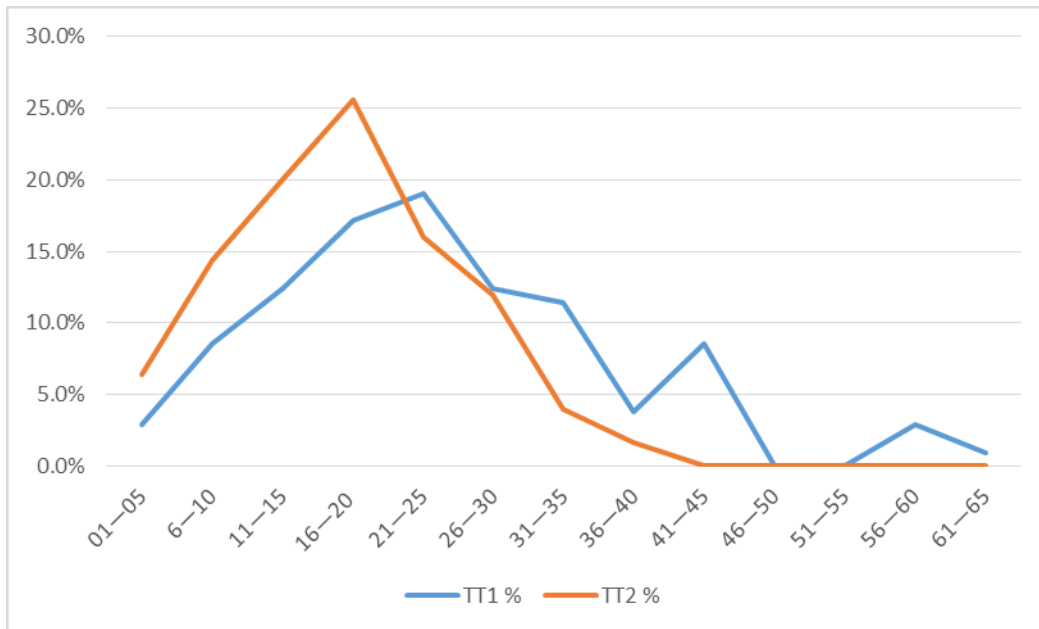


Figure 9: Sentence length in TT1 and TT2

TT2-line is more oriented towards the left side of the figure, i.e. shorter sentences. TT1-line, on the other hand, has fewer short sentences, but the graph continues further towards the right side of the figure, i.e. towards longer sentences. The average sentence length of TT1 is 24.5 words, whereas the average of TT2 is 17.56 words. The average sentences length of TT1 is 37% higher than TT2. In addition to average sentence length, the sample maximums differed greatly between the two translations. The longest sentence in TT2 was 39 words long, while the longest sentence in TT1 was 65 words long. Moreover, 13 sentences in TT1 were longer than the longest sentence in TT2.

It would have been interesting to perform a similar test on clause length, but as clause analysis is extremely time-consuming and difficult, it was not included in this study. Although the annotation software can be used to examine certain syntactic elements, it does not lend itself well to conducting a thorough clause analysis.

The difference in sentence length is the most striking result so far. Possible explanations for the difference will be offered in Section 5.2.1 below, which includes the qualitative analysis of the syntactic changes.

5.2 Qualitative analysis

This section includes the qualitative analysis of the study. This part of the analysis was conducted by close reading excerpts from TT1 and TT2 side by side. The findings have been categorized into 4 categories: changes in syntax, changes in terminology, omissions, and addressing the reader.

However, before venturing deeper into the qualitative analysis of the excerpts, we have to look at the norms that come *before* the act of translating can begin, i.e. the preliminary norms concerning the two translations. There are two important preliminary norms that have to be addressed in this analysis, the first being the **norm of who is allowed to translate**, the second being **what is deemed worth translating**.

As stated in Section 3.4.2, the field of non-fiction translation has changed quite a bit during the last hundred years, at least partly due to scientific progress. Increased knowledge requires more specialization, which has resulted in translation ‘generalists’ no longer being able to translate texts from all fields of science.

The first Finnish translation of *Origin of Species*, A.R. Koskimies, was a translator and a linguist. In addition to Darwin, he translated fiction, including Jane Austen and George Sava. Pertti Ranta, the man behind the newest translation, on the other hand, is an expert in the field of biology. He has also translated Darwin’s *The Voyage of the Beagle*. This is a clear example of the norm of *specialists as translators*, which I postulated in section 3.4.2.

The second preliminary norm is related to **the choice of works to be translated**. Especially intriguing is the fact that the first translation is based on the sixth and final edition of *On the Origin of the Species*, while the latest translation is based on the first edition. This is counterintuitive: surely the latest translation should be based on the ‘most advanced’ and ‘most up-to-date’ version of the source text?

The choice between different editions is influenced by many factors. The reasoning is closely related to the reason for retranslation in the first place. According to Leikola (2013: 442), *Origin of Species* was already somewhat outdated when it was finally published in Finnish in 1913–1917. It had been almost 60 years since Darwin’s ground-breaking work was initially published. The translation work of the first translation was funded by The Finnish Senate (ibid.), and was undertaken mainly for cultural reasons. According to Leikola, Finnish readership was not large

enough for the publication to be profitable, but since the work was already considered a classic in its field, it was nevertheless published.

Ranta (2009: 419–421) has explained the need for retranslation in the epilogue of his translation. He states that although new editions of Koskimies' translation have been published as lately as 2009, they have been unchanged editions. Although Ranta considers the first translation praiseworthy, he feels that a modern reader does not recognize the hundred-year-old text as their own. The main goal of the new translation is to make Darwin's work available to modern readers. However, this does not explain why he has chosen to base his translation on the first edition of *Origin of Species*. He explains the reasoning behind the choice of edition in the epilogue as follows (my translation):

“According to researchers, one gets the best impression of Darwin's revolutionary thoughts by reading the first edition of *On the Origin of the Species*, which is why this translation is based on that edition.”

This quote highlights the reason for retranslating the work in the first place. *Origin of Species* is a classic in its field because of the massive influence it has had on almost all fields of science. Even though at this point there are better books about evolution and natural selection, Darwin's work – and especially its first edition – remains *the* book about natural selection. Interestingly enough, Bahtin's ideas about the intrinsic value of the original (see section 2.2.1) seem to apply to different editions, too.

5.2.1 Changes in syntax

By far the most striking feature that has undergone changes was the sentence structure. As the quantitative analysis showed (see section 5.1.8), the average sentence length of TT1 was 37% longer than in TT2. This result was clearly evident in the qualitative analysis as well: there were 15 cases in which TT2 had opted for a simpler sentence structure than TT1, i.e. dividing the text into shorter sentences. Example 3 below illustrates a typical case.

Example 3

Paljon tutkielmia on julkaistu eri kielillä kyyhkysistä ja monet niistä, ollen sangen vanhoja, ovat hyvin huomattavia. (TT1/1)

Eri puolilla maailmaa ja eri kielillä on julkaistu monia kyyhkyjä käsitteleviä tutkielmia. Jotkut niistä ovat huomattavan vanhoja. (TT2/1)

The opposite also occurred twice in the material: on two occasions TT2 sentences were more complex than TT1, as shown in Example 4.

Example 4

Tässä meitä kohtaa Malthuksen oppi, sovellettuna monin verroin ankarampana koko kasvi- ja eläinkuntaan. Sillä tässä tapauksessa ei voi tulla kysymykseen mikään ravinnon keinotekoinen kartuttaminen eikä harkittu pidättäytyminen aviosta. (TT1/9)

Olemassaolon taistelu on Malthusin oppi sovellettuna moninkertaisella voimalla koko eläin- ja kasvikuntaan; siinä ei voida ajatella keinotekoista lisäruokintaa eikä järkevää pidättäytymistä avioliitosta. (TT2/9)

Additionally, TT1 chose to divide sentences more often using a semicolon, 11 times in total, whereas TT2 only had one semicolon. Modern writing norms (Korpela 1996: 4.4) tend to advise against using a semicolon, as it is easy to use incorrectly and can often be avoided. Most of the semicolons used in TT1 seem to serve as alternatives for colons, commas or other punctuation. It seems that semicolons are used as a stylistic tool to control the flow of the text. Example 5 below shows a typical case.

Example 5

Kerran löysin hämmästykseni riippumattoman F. flava muurahaisten yhteiskunnan orjia pitävien F. sanguinea muurahaisten keon alla olevan kiven alta; ja kun sattumalta tulin pöyhineeksi kumpaakin pesää, kävivät pikkumuurahaiset hämmästyttävällä rohkeudella suurten naapuriensa kimppuun. (TT1/13)

In addition to semicolons, TT1 also used more dashes than TT2. There were five cases of dash use in TT1, and only one in TT2. Using a dash has a strongly emphasising function in written Finnish. Because of this, modern language norms tend to advise not to overuse them (Korpela 1996: 4.10).

Nested sentences, i.e. subordinating clauses that interrupt the main clause, were common in TT1. They are known to reduce the readability of texts (Virtaniemi 1992), since they separate closely connected parts of the text from each other. Nested sentences force the reader to re-read sentences. According to Virtaniemi, nested sentences are especially disrupting if a) they are long, or b) there are many of them in succession. Example 6 below shows an example of a nested sentence found in TT1. Instead of opting for a long, complex sentence, TT2 has opted to divide the text into two sentences.

Example 6

Kasveissa tämä jalostuminen, **jonka aiheuttaa parhaiden yksilöiden satunnainen säilyminen – olkootpa nuo yksilöt niin eroavia, että niitä heti niiden esiintyessä voidaan pitää erityisinä muunnoksina tai älkööt ja olkoonpa kahta tai useampia eri lajeja tai rotuja sekoitettu toisiinsa tai älköön – kasveissa tämä jalostuminen** on selvästi havaittavissa lisääntyneestä koosta ja kauneudesta, joka pistää silmäämme orvokin, ruusun, pelargoniumin, georginin y.m. kasvien muunnoksissa, verratessamme niitä vanhempiin muunnoksiin ja kantalajeihin. (TT1/5)

Kasveissa sama vähittäinen jalostumisprosessi tapahtuu säilyttämällä satunnaisesti parhaat yksilöt riippumatta siitä, onko niitä mahdollista luokitella erillisiksi muunnoksiksi vai ei, tai siitä, ovatko ne

syntyneet risteytymisen tuloksena vai ei. Prosessi lisää kokoa ja kauneutta, kuten nyt voidaan nähdä orvokeissa, ruusuissa, pelargonioissa, daalioissa ja muissa kasveissa, kun niitä verrataan aikaisempiin muunnoksiin tai kantamuotoihin. (TT2/5)

In addition to nested sentences, other forms of syntactic complexity was found in TT1. As noted in sections 5.1.1 and 5.1.7, there were significant differences in the use of infinitive verb forms and possessive suffixes between TT1 and TT2: second infinitive and first person possessive suffix were almost completely unused in TT2. There can be many reasons for this, but one possible explanation is that both of these textual features are often found in non-finite clauses, which can be used as alternatives for subordinating clauses. Examples 7 and 8 below show examples of situations where this has happened.

Example 7

Sillä uuden hyönteislajin **tullessa** saarelle täytyi luonnollisen valinnan pyrkimyksenä olla joko suurentaa tai pienentää sen siipiä, --- (TT1/11)

Kun uusi hyönteinen **saapui** saarelle, luonnonvalinnan pyrkimys suurentaa tai pienentää sen siipiä --- (TT2/11)

Example 8

Kerran, kun tämä oli hyvin selvään huomattavissa, panin kennon takaisin pesään ja annoin mehiläisten jatkaa työtänsä kotvan aikaa; **tarkastaessani** sitten uudelleen solua havaitsin, että vinoneliö-levy oli laadittu valmiiksi ja oli nyt aivan tasainen. (TT1/14)

Yhdessä tapauksessa, kun näin oli ilmiselvästi käynyt, laitoin kennon takaisin pesään ja annoin mehiläisten jatkaa työtään vähän aikaa, **ennen kuin jälleen tutkin** kennon. (TT2/14)

In the two examples above, TT1 has opted for a non-finite clause, while TT2 chose a subordinating clause. Korpela (2004: 10.4) notes that non-finite clauses are often shorter than subordinating clauses, but subordinating clauses are more **unambiguous** and therefore preferable. He notes that using non-finite clauses used to be considered clever, compact use of language. However, most modern language guides tend to advise to avoid non-finite clauses, as subordinate clauses are usually more comprehensible. According to Löytty (2002: 174), subordinating clauses tend to retain correct pronoun referents better than non-finite clauses, which may be a reason why they are nowadays avoided in non-fiction.

As stated in section 5.1.8, the sentences of TT1 were significantly longer than in TT2. Combined with all of the findings above, it can safely be said that the sentence structure of TT1 is indeed, as hypothesized, more complex than that of TT2. Changes in syntactical complexity can be at least partially attributed to increased demand – or understanding – of readability. These changes can therefore be linked to the **norm of readability and clarity of information**, introduced in section

4.4.2. With that being said, this does not necessarily mean that the *norm* itself has changed. Perhaps readability was deemed just as important when the first translation was published. It may be more accurate to say that our knowledge about what is readable has increased, resulting in improved readability.

5.2.2 Changes in terminology

As fields of science have developed, terminology has established. As translator Ranta (2009: 420–421) notes in his epilogue of TT2, some of the terms used in TT1 have been replaced by other words, resulting in modern readers being unable to recognize their meaning. Some of the differences in terminology are introduced in examples 9 to 17 below.

Example 9

Jalostusta ei yleensä suinkaan saada aikaan eri rotujen **ristisiitoksella**. (TT1/2)

Jalostusta ei yleensä saada aikaan **risteyttämällä**, vaan... (TT2/2)

Bank of Finnish Terminology in Arts and Sciences recognizes the term *ristisiitos*, but defines it as the result of cross-pollination. Since the excerpt in question concerns pigeons, it can be said that the term is incorrect in modern language use. In a context such as this, *risteytys* is nowadays accepted as the correct term.

Example 10

Siten tällaiset valioeläimet tulevat jättämään enemmän jälkeläisiä kuin huonommat, joten tässä tapauksessa olisi kysymys jonkunlaisesta jatkuvasta **siitosvalinnasta**. (TT1/4)

Erinomaiset eläimet tuottavat tavanomaisesti enemmän jälkeläisiä kuin huonommat, joten tässäkin tapauksessa on meneillään **tiedostamaton valinta**. (TT2/4)

The term used in TT1, *siitosvalinta*, could be translated directly as *breeding selection*. The term opted for by TT2, *tiedostamaton valinta*, is a word-for-word translation of the term *unconscious selection* used in ST. TT2 could arguably be called as being more loyal to the original in this matter.

Example 11

...joka **erilaistumisen aatteen** mukaan eroaa enemmän A:sta kuin muunnos a¹. (TT1/10)

...joka **ominaisuuksien erilaistumisen periaatteen** mukaisesti eroaa enemmän lajista A kuin muunnos A¹. (TT2/10)

The main focus of Example 5 is the difference between words *aate* (cause, ideology) and *periaate* (principle). The term used in ST is *principle*. Although *aate* may have meant principle in the past,

modern dictionaries such as *Kielitoimiston sanakirja* (2016) do not recognize this meaning. In terms of this term, TT2 is more up-to-date.

Example 12

...kasveissa tämä jalostuminen on selvästi havaittavissa lisääntyneestä koosta ja kauneudesta, joka pistää silmäämme orvokin, ruusun, **pelargoniumin**, **georginin** y.m. kasvien muunnoksissa, verratessamme niitä vanhempiin muunnoksiin ja kantalajeihin. (TT1/5)

Prosessi lisää kokoa ja kauneutta, kuten nyt voidaan nähdä orvokeissa, ruusuissa, **pelargonioissa**, **daalioissa** ja muissa kasveissa, kun niitä verrataan aikaisempiin muunnoksiin tai kantamuotoihin. (TT2/5)

Pelargonium used in TT1 is the Latin name of the genus, whereas TT2's **pelargonioissa** is based on the Finnish name of the genus, nowadays commonly used in gardening. The story behind **georgini** and **daalia** is a bit more peculiar; the genus *Dahlia* was originally known as *Georgina* after German-Russian botanist Johan Georgin, but the name was changed. *Dahlia* is derived from Swedish botanist Anders Dahl, after whom the genus is named (Perinnepiha). Nowadays *dahlia* and *daalia* are the widely recognized name.

Example 13

Voimakkaimpana näemme tämän taipumuksen juovikkaisuuteen esiintyvän useiden mitä erilaisimpien lajien **sekasikiöissä**. (TT1/12)

Taipumus raidallisuuteen on vahvin kaikkein erilaisimpien lajien **risteytymien** välillä. (TT2/12)

Bank of Finnish Terminology on Arts and Sciences considers *sekasikiö*, *risteymä* and *hybridi* synonyms. While technically still correct, **sekasikiö** has negative connotations in some contexts, and is often used in relation to something ugly, unpleasant or unwanted. **Risteymä** is more neutral in tone.

Example 14

Pitkin länsirannikkoa, jolla asustaa omituinen merieläimistö, ovat **tertiari maatumat** niin heikosti kehittyneitä, etteivät ne luultavasti tule kaukaiseen tulevaisuuteen säilyttämään mitään kertomusta toisiaan seuraavista erikoisista merieläimistöistä. (TT1/18)

Pitkin koko länsirannikkoa, jolla elää erikoista merieläimistöä, **tertiäärikäutiset kerrostumat** ovat niin niukkoja, etteivät ne todennäköisesti kykene säilyttämään todisteita useista peräkkäisistä merieläimistöistä. (TT2/18)

Tertiari and **maatuma** are not found in the Bank of Finnish Terminology on Arts and Sciences. **Tertiäärikausi** and **kerrostuma** are recognized.

Example 15

...vaikka sinne aikojen kuluessa on täytynyt **laskeutua runsaasti lietettä**, päättäen siitä, että rantakalliot ovat tavattomasti **kuluneet** ja mereen laskee mutaisia virtoja. (TT1/18)

...vaikka **sedimenttitarjonnan** täytyy olla suurta, kuten rantakallioiden valtavasta **rapautumisesta** ja mutaisten jokivesien valumisesta mereen voi päätellä. (TT2/18)

ST uses *supply for sediment*, which has been translated as **laskeutua runsaasti lietettä** and **sedimenttitarjonnan**. Bank of Finnish Terminology on Arts and Sciences defines *liete* as “a pumpable mixture of solids and fluid”, while *sedimentti* is defined as *the matter of particles on the bottom of a body of water*. The meaning of both translations is the same. However, it is interesting to note that TT1 has opted for a more domesticating approach, as *liete* is a common Finnish word, whereas TT2 has opted for a special-field term *sedimentti*. *Sedimentti* may not have been known to readers of TT1, but it is common stock in modern Finnish.

Additionally, TT1 has opted for a general word **kuluminen** for *degradation*, while TT2 uses **rapautuminen**, defined as “slow crumbling of rock material” by the Bank of Finnish Terminology on Arts and Sciences. In terms of modern Finnish, TT2 is therefore more accurate than TT1.

Example 16

Selitys on epäilemättä se, että **littoraliset ja sublittoraliset kerrostumat** myötäänsä kuluvat pois... (TT1/18)

Selitys on epäilemättä **rantavyöhykkeen kerrostumien** jatkuva kuluminen pois... (TT2/18)

In Example 16 above, TT1 opted for more accurate terminology. The terms used in ST, *littoral* and *sub-littoral deposits*, have been directly translated in TT1 as **littoraliset ja sublittoraliset kerrostumat**. Although the terms are nowadays spelled differently (*litoraali* and *sublitoraali*), they are recognized by the Bank of Finnish Terminology on Arts and Sciences. In contrast to Example 12, TT2 has here opted for a general-level term *rantavyöhykkeen kerrostumat*, which is less precise than the one used in TT1. The reason for this is not clear: perhaps the translator considered it excess information, or more available for layman-readers.

Example 17

Mutta koska vuoriharjanteet, **erämaat** y. m. eivät ole yhtä ylipääsemättömiä eivätkä nähtävästi yhtä vanhaa alkuperää kuin mannermaita erottavat valtameret... (TT1/19)

Korkeiden ja yhtenäisten vuorijonojen ja **aavikoiden** eri puolilla ja toisinaan jopa suurten jokien vastarannoilla on erilaista lajistoa. (TT2/19)

Erämää (wilderness) has been replaced with *aavikko* (desert). The term used in ST was *great deserts*. According to *The New Dictionary of Modern Finnish*, *erämaa* is an archaic equivalent for *aavikko*. Although TT1 may seem inaccurate to a modern reader, it was just as accurate as TT2 when it was first published. The difference is related to natural language change.

5.2.3 Omissions

As noted earlier in section 4.1, TT1 is almost 400 words longer than TT2. The most obvious possible explanation for this would be an omission of some sort. However, only one clear case of omission of semantic content was found. In context it can be said that the sentence was most likely omitted because of irrelevancy.

Example 18

Kaikki parhaat kasvattajat ovat tätä menettelyä vastaan, paitsi toisinaan lähisukuisten alarotujen välillä; **ja kun risteytys on tapahtunut, niin mitä tarkin valinta on vielä paljon välttämättömämpi kuin tavallisesti.** (TT1/2)

...ja kaikki parhaat kasvattajat vastustavat kovasti tätä käytäntöä, paitsi joskus lähisukuisten alalajien välillä. (TT2/2)

It is safe to say that the difference in the lengths of TT1 and TT2 cannot be a result of significant omissions of semantic content. Instead, it seems that TT2 is shorter due omissions of a few words here and there throughout the text. I have decided to call these **flavour omissions**, as their purpose seems to be to place emphasis on other words instead of conveying information themselves. There were numerous examples of this throughout the excerpts, some of which are exemplified below.

Example 19:

Jos jollekin on suotu nämä ominaisuudet ja jos hän tutkii alaansa vuosikausia, **omistaen sille koko elämänsä järkähtämättömällä lujuudella**, niin hän menestyy ja saa aikaan suuria parannuksia. (TT1/2)

Jos hän on tässä suhteessa lahjakas ja opiskelee aihetta **vuosien ajan sisukkaasti**, hän onnistuu ja saa aikaan suuria parannuksia. (TT2/2)

Example 20:

Sillä miksi olisi hedelmättömyys niin **äärettömän** eriasteista eri lajeja risteytettäessä, joille kaikille luulisi olevan yhtä tärkeätä, että niiden toisiinsa-sekaantuminen tulisi estetyksi? (TT1/16)

Miksi monenasteista hedelmättömyyttä esiintyy risteytystilanteissa, jos pitää kuitenkin olettaa, että on yhtä tärkeää estää kaikkia lajeja sekaantumasta? (TT2/16)

This finding can be attributed to the **norm of conciseness** (Korpela 1996: 4.3, Vehmas-Lehto 1989: 56), which is a prevalent norm in contemporary non-fiction. There is a clear tendency to favour

concise communication in informative texts. It seems that TT2 often opts for a solution that conveys the same message more concisely, resulting in shorter sentences and overall less text, while TT1 does not shy away from longer, more poetic expressions.

5.2.4 Visibility of the writer and the reader

As shown in section 5.1.1, TT1 favoured imperative mood while TT2 favoured indicative mood. This results in TT2 feeling more passive and distant from the reader than TT1. This was also noted in the qualitative analysis: TT1 addressed the reader or otherwise includes the reader on multiple occasions, as illustrated in Examples 21 and 22 below.

Example 21

Verratkaapa englantilaista kirjekyyhkystä lyhytotsaiseen kuperkeikkakyyhykseen ja **huomatkaa** nokkien ihmeellinen erilaisuus, jota seuraa vastaava pääkallojen erilaisuus. (TT1/1)

Esimerkiksi englantilaista kirjekyyhyä ja lyhytnokkaista kuperkeikkakyyhyä **verrattaessa huomio kiinnittyy** niiden nokkien hämmästyttävän suureen eroon sekä sitä vastaavaan eroon lintujen kalloissa. (TT2/1)

Example 22

Katsokaapa kuinka erilaisia ovat kaali-kasvin lehdet ja kuinka tavattoman yhtäläisiä kukat! (TT1/3)

Kuinka erilaisia kaalien lehdet ovat, mutta kuinka samanlaisia niiden kukat. (TT2/3)

In addition to verb mood, section 5.1.1 also showed significant differences in person of verbs. First person plural forms, such as *menkäämme* or *tehkäämme*, were relatively common in TT1, but entirely unused in TT2. TT2, on the other hand, used more third person singular forms, such as *kannattaa*, *tapahtuu*, and *tuottaa*, which are more neutral. Example 23 below shows a common case of TT1 opting for a PL1 form, while TT2 chooses to avoid it. Again, TT2 is more objective and distant from the reader.

Example 23

Vanhimpia ja puhtaimpia erivärisiä rotuja keskenään risteyttäessä **näemme**, kuinka 102 sekasikiössä esiintyy voimakkaana taipumus sinertävän värin ja mainittujen juovien sekä kirjailujen uudelleen ilmaantumiseen. (TT1/12)

Kun vanhimpia ja puhtaimpia rotuja risteytetään, on sinisellä värillä sekä juovilla ja merkeillä voimakas taipumus ilmaantua uudelleen risteymissä. (TT2/12)

In general, it seems that person is faded out from TT2, while it is clearly evident in TT1. TT2 favours passive, as illustrated in example below.

Example 24

...sillä **näin** niiden heti innokkaasti tarttuvan *F. fuscan* koteloihin...(TT1/13)

...ja sen **on nähty** hyökkäävän hurjasti toisia muurahaisia vastaan. (TT2/13)

As shown in section 5.1.4, there were major differences between TT1 and TT2 in personal pronoun use. Although the sample size was small, a total of 34 personal pronouns in both texts, the differences were striking. TT1 used over twice as many pronouns as TT2. The difference in first person plural *me* is especially interesting: it was used eight times in TT1, but only once in TT2. Examples 18 and 19 below illustrate some of the differences in personal pronoun use between the two texts: TT2 has a tendency to avoid using personal pronouns, which are often replaced by generic persona (Example 25), passive (Example 26) or inflection.

Example 25

Samoin, jos luonnon lajien joukossa katselemme hyvin selvästi eroavia sukulaismuotoja, kuten esim. hevosta ja tapiiria, **ei meillä ole** mitään syytä olettaa, että milloinkaan on ollut olemassa suoranaisia välimuotoja, jotka yhdistivät kummankin lajin yhteiseen kantamuotoon. (TT1/17)

Tarkasteltaessa hyvin erilaisia luonnonlajeja, kuten esimerkiksi hevosta ja tapiiria, **ei ole** syytä olettaa niiden välillä koskaan olleen välimuotoja. (TT2/17)

Example 26

Me näemme hevosen suvun eri lajien yksinkertaisen muuntumisen kautta tulevan juovikkaiksi, joko jaloistaan kuten sebra tai lavoistaan kuten aasi. (TT1/12)

Useiden hyvin erillisten hevosen suvun lajien **nähdään** saavan yksinkertaisen muuntelun kautta raitoja jalkoihinsa raitoja kuten seepralla tai lapoihinsa kuin aasilla. (TT2/12)

As the examples above illustrate, TT1 has a tendency to include the reader, while TT2 mostly avoids addressing the reader. However, this does not mean that the writer is completely faded out from TT2: Darwin is still present in the text, but not to the same extent as in TT1. As a result of all this, it can be argued that TT2 is stylistically more objective than TT1. This tendency to hide the writer and view the subject matter from a distance can be linked to the **norm of objectivity** (Luukka 2002: 20–21), which is one of the most well-known and respected norms of scientific writing.

6 Conclusion

The main goals of this study were to find out whether the differences between the two translations can be attributed to changes in the norms of translating non-fiction, and if so, how these changes manifest themselves in the translations. Additionally, I wanted to test whether combining a statistical method and text analysis was a viable method for studying translation norms.

As far as I am concerned, all of the goals set for this study were met. The quantitative analysis showed that there are significant differences between the two translations' distribution of textual and grammatical features. However, this result alone does not tell us anything about norms of translation. Because of this, the statistical analysis had to be accompanied by a qualitative textual analysis. Many of the results of the statistical analysis were supported by the findings of the qualitative analysis, proving the two methods to be mutually beneficial. Most importantly, I think I succeeded in linking some of my findings to translation norms discovered from various extratextual sources, ranging from language guides to previous research on translation norms.

In my opinion, the most severe shortcoming of the study is the lack of information about old norms and normative pronouncements. I was hoping I would be able to find sources that described the translation norms of non-fiction (or just norms of non-fiction) that were prevalent during the early 20th century, which would have allowed me to compare the two translations and the norms behind them. However, it turned out that such sources are either terribly difficult to come by or non-existent. I was able to find some sources related to norms of non-fiction translation, but they discussed even earlier phases of written Finnish, and were of no use. Because of this, I have mainly focused on explaining the differences between the two translations in terms of modern translation norms.

The statistical analysis showed that the two translations differ from each other significantly in the distribution of verb infinitive forms, person of verbs, and possessive suffixes. More thorough analysis revealed that the prevalence of infinitive forms and possessive suffixes in TT1 was explained by a high number of non-finite clauses, which utilize both of these textual features. Since non-finite clauses are often considered more ambiguous than subordinating clauses, this finding was linked to the norm of **readability and clarity of information**, which seems to be a common norm in contemporary translation of non-fiction. This result shows that TT2 seems to favour sentences that are easy to comprehend while maintaining their informative content. Additionally, the style of the original has been toned down on many occasions to improve the readability of the text.

As expected, there were differences in the terminology of the two translations. Finnish biological terminology has changed greatly during the last hundred years, resulting in many term choices of the first translation feeling outdated or archaic. However interesting these findings may be, they can scarcely be explained by changes of norms, as the norm has remained the same. In fact, the norm of accurate terminology has been important in non-fiction translation since the 19th century. Updating terminology is a natural result of language change.

The qualitative analysis revealed that the difference in the lengths of TT1 and TT2 could be at least partially explained by TT2's tendency to omit a few words here and there. I have called such occurrences **flavour omissions**, as the omitted words often carried little to no information. As a result, TT2 feels stylistically more neutral and objective than TT1, which in turn feels more poetic. I have linked this finding to the **norm of conciseness**.

The qualitative analysis also showed that TT1 and TT2 differ greatly in the way both the reader and the writer are presented in the text. It was discovered that TT2 often opts for forms that hide or fade out the writer by using passive voice or generic persona, which results in a more neutral tone. On the other hand, TT1 often includes both the writer and the reader in the text by using more possessive suffixes, first and second person of verbs, and personal pronouns. This finding was linked to the **norm of objectivity** common in scientific discourse.

Overall it can be said that the most striking differences between the two translations are related to syntax. The analysis showed that TT1's sentences were significantly longer than TT2's, utilizing more complex syntax, including plenty of nested sentences and non-finite clauses. Had I known this beforehand, I would most likely have focused this entire study on syntactic analysis, as it turned out to be the most fruitful part of the material in terms of changes. Unfortunately a full clause analysis of the research material was beyond the scope of this study, as it would have required excessive amounts of work to conduct. A more detailed analysis of the syntax of translated non-fiction – perhaps utilizing corpus-methods and larger amounts of research material – would be an interesting area for future research.

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Appendix 1: Excerpts from the old translation

TT1/1 Ollen sitä mieltä, että on aina paras tutkia jotakin erikoista ryhmää, olen tarkasti harkittuani valinnut siihen tarkotukseen kotikyyhkyset. Olen kasvattanut kaikkia rotuja, joita saatoin ostaa tai muuten hankkia ja minulle on suosiollisesti lähetetty nahkoja eri maailman kulmilta, eritotenkin ovat niitä lähettäneet W. Elliot Intiasta ja C. Murray Persiasta. Paljon tutkielmia on julkaistu eri kielillä kyyhkysistä ja monet niistä, olen sangen vanhoja, ovat hyvin huomattavia. Olen asettunut yhteyteen useiden etevien kyyhkyskasvattajain kanssa ja minun on sallittu liittyä kahden Lontoon kyyhkysklubin jäseneksi. Kyyhkysrotujen erilaisuus on jotakin hämmästyttävää. Verratkaapa englantilaista kirjekyyhkystä lyhytotsaiseen kuperkeikkakyyhkyyseen ja huomatkaa nokkien ihmeellinen erilaisuus, jota seuraa vastaava pääkallojen erilaisuus.

TT1/2 Kuinka huomattavia tuloksia englantilaiset kasvattajat ovat tähän saakka jo aikaansaaneet, näkyy niistä suunnattomista hinnoista, joita maksetaan eläimistä, joilla on hyvä sukupuu, ja näitä on viety maasta kaikkiin maailman ääriin. Jalostusta ei yleensä suinkaan saada aikaan eri rotujen ristisiitoksella. Kaikki parhaat kasvattajat ovat jyrkästi tätä menettelyä vastaan, paitsi toisinaan lähisukuisten alarotujen välillä; ja kun risteytys on tapahtunut, niin mitä tarkin valinta on vielä paljon välttämättömämpi kuin tavallisesti. Jos valinta perustuisi ainoastaan siihen, että olisi erotettava jokin selvä muunnos ja kasvatettava sitä, niin periaate olisi niin ilmeinen, että siitä tuskin kannattaisi puhua. Mutta sen suuri tärkeys perustuu vaikutuksiin, jotka syntyvät, kun sukupolvi sukupolvelta kartutetaan määrättyyn suuntaan eroavaisuuksia, joita, tottumaton silmä ei huomaa ensinkään, eroavaisuuksia, joita turhaan olen yrittänyt yksitellen huomata. Tuhannen joukossa ei ole yhtä ihmistä, jolla on kyllin tarkka silmä ja riittävästi arvostelukykyä tullakseen oivalliseksi kasvattajaksi. Jos jollekin on suotu nämä ominaisuudet ja jos hän tutkii alaansa vuosikausia, omistaen sille koko elämänsä järkähtämättömällä lujudella, niin hän menestyy ja saa aikaan suuria parannuksia. Mutta jos häneltä puuttuu yksikin näistä ominaisuuksista, niin hän varmasti epäonnistuu. Harvat uskonevat, kuinka paljon luontaista taipumusta ja vuosikausien harjaantumista vaaditaan tullakseen taitavaksi kyyhkyskasvattajaksikin.

TT1/3 Kasveissa huomaa siitosvalinnan kautta karttuneet vaikutukset vielä erään toisenkin keinon avulla, nimittäin tarkastamalla saman lajin eri kukkamuunnosten erilaisuutta kukkatarhassa, vertaamalla lehtien, siemenkotelojen, juurimukulain tai muiden arvokkaiden osien erilaisuutta kyökkikasvitarhassa samojen muunnosten kukkiin sekä vertaamalla saman lajin hedelmämuunnosten erilaisuutta hedelmäpuutarhassa vastaaviin lehti- ja kukkamuunnoksiin. Katsokaapa kuinka erilaisia ovat kaali- kasvin lehdet ja kuinka tavattoman yhtäläisiä kukat! Kuinka erilaisia ovat orvokin kukat ja kuinka samanlaisia lehdet! Kuinka paljon eroavatkaan eri karviaismarjalajien hedelmät toisistaan kooltaan, väriltään, muodoltaan ja karvaisuudeltaan, ja kumminkin ilmenee kukissa hyvin vähän eroavaisuutta!

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TT1/4 Jos olisikin olemassa niin alhaisella kannalla olevia metsäläisiä, ettei heillä olisi aavistustakaan siitä, että heidän kotieläintensä ominaisuudet periytyvät niiden jälkeläisiin, niin he ainakin koettavat huolellisesti säilyttää jokaisen eläimen, joka on heille hyödyllinen johonkin erikoiseen tarkoitukseen, nälänhädän ja muiden onnettomuuksien sattuessa, jotka niin helposti kohtaavat metsäläisiä. Siten tällaiset valioeläimet tulevat jättämään enemmän jälkeläisiä kuin huonommat, joten tässä tapauksessa olisi kysymys jonkunlaisesta jatkuvasta siitosvalinnasta. Me näemme Tulimaan raakalaistenkin panevan arvoa eläimiinsä, he kun nälänhädän aikoina tappavat ja syövät vanhat naisensa, pitäen heitä vähemmänarvoisina kuin koiriaan.

TT1/5 Kasveissa tämä jalostuminen, jonka aiheuttaa paraiden yksilöiden satunnainen säilyminen — olkootpa nuo yksilöt niin eroavia, että niitä heti niiden esiintyessä voidaan pitää erityisinä muunnoksina tai älkööt ja olkoonpa kahta tai useampia eri lajeja tai rotuja sekotettu toisiinsa tai älköön — kasveissa tämä jalostuminen on selvästi havaittavissa lisääntyneestä koosta ja kauneudesta, joka pistää silmäämme orvokin, ruusun, pelargoniumin, georginin y. m. kasvien muunnoksissa, verratessamme niitä vanhempiin muunnoksiin ja kantalajeihin. Ei kukaan odottane koskaan saavansa ensiluokkaista orvokkia tai georginia viljelemättömän kasvin siemenestä. Ei kukaan uskone voivansa kasvattaa ensiluokkaista mehupäärynää villin päärynäpuun siemenestä, joskin hänen onnistuisi kasvattaa sellainen kitukasvuisesta, metsistyneestä taimesta, joka on alkuperältään puutarhalajia. Vaikka päärynää viljeltiin jo klassillisina aikoina, näyttää se Pliniuksen kuvauksista päättäen silloin olleen varsin vähä- arvoinen hedelmä.

TT1/6 Kun siis on päätettävä, onko jokin muoto luettava lajiksi vai muunnokseksi, näyttää terveen arvostelukyvyn ja laajan kokemuksen omaavien luonnontutkijain mielipide ainoalta seurattavalta oppaalta. Meidän täytyy kumminkin useissa tapauksissa ratkaista luonnontutkijain enemmistön mukaan, sillä harvoja selväpiirteisiä ja hyvin tunnettuja muunnoksia voidaan mainita, joita eivät ainakin muutamat pätevät asiantuntijat olisi lukeneet lajeiksi.

TT1/7 Että tällaiset epävarmat muutokset eivät suinkaan ole harvinaisia, ei ole kiellettävissä. Verratessamme eri kasvientutkijain esittämiä Ison- Britannian, Ranskan tai Yhdysvaltojen kasvioita, näemme kuinka hämmästyttävän monia muotoja toiset kasvintutkijat pitävät lajeina, toiset pelkkinä muunnoksina. H. G. Watson, jolle olen kiitollisuuden velassa monesta avustuksesta, on minulle merkinnyt 182 brittiläistä kasvia, joita tavallisesti pidetään muunnoksina, mutta joita kaikkia kasvientutkijat ovat toisinaan pitäneet lajeina. Ja kumminkin hän on tätä luetteloa laatiessaan jättänyt huomioon ottamatta monet vähäiset muunnokset, jotka useat kasvientutkijat ovat lukeneet lajeiksi, sekä tykkänään sivuuttanut monet kovin polymorfiset suvut.

TT1/8 Pitäen lajeja ainoastaan selväpiirteisinä ja tarkasti määriteltävinä muunnoksina johduin tekemään sen ennakko- otaksuman, että laajempien sukujen lajeista jokaisella alueella esiintyy muunnoksia useammin kuin pienempien sukujen lajeista. Sillä missä

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tahansa on muodostunut useita lähisukuisia (s. o. samaan sukuun kuuluvia) lajeja, siellä säännöllisesti on parhaillaan muodostumassa paljon muunnoksia ja alulla olevia lajeja. Missä paljon suuria puita kasvaa, siellä odotamme tapaavamme myöskin vesoja. Siellä, missä suvusta on muuntelun kautta muodostunut useita lajeja, ovat olosuhteet olleet muuntelulle suotuisat; ja tästä syystä voimme otaksua, että olosuhteet edelleenkin ovat muuntelulle suotuisat. Jos sitävastoin pidämme jokaista lajia erikoisen luomistyön tuloksena, ei ole olemassa mitään nähtävää syytä, miksi monilajisessa ryhmässä esiintyy enemmän muunnoksia kuin harvalajisessa.

TT1/9 Olemassaolo- taistelu on välttämätön seuraus kaikkien elollisten olentojen suuresta lisääntymistaipumuksesta. Jokaisen olennon, joka luonnollisena elinaikanaan tuottaa useita munia tai siemeniä, täytyy joutua kärsimään hävitystä jonakin ikäkautenaan, jonakin vuodenaikana taikkapa satunnaisesti jonakin vuonna, muuten sen lukumäärä karttuisi geometrisena sarjana tapahtuvan lisääntymisen johdosta nopeasti niin suunnattoman suureksi, ettei mikään alue voisi elättää sen jälkeisöä. Kun näin syntyy useampia yksilöitä kuin voi jäädä elämään, on tästä aina seurauksena taistelu olemassaolosta joko kahden samaan lajiin kuuluvan yksilön, eri lajeihin kuuluvien yksilöiden tai yksilön ja ulkonaisten olosuhteiden välillä. Tässä meitä kohtaa Malthuksen oppi, sovellettuna monin verroin ankarampana koko kasvi- ja eläinkuntaan. Sillä tässä tapauksessa ei voi tulla kysymykseen mikään ravinnon keinotekoinen kartuttaminen eikä harkittu pidättäytyminen aviosta. Olkoonpa, että muutamien lajien lukumäärä tällä haavaa onkin enemmän tai vähemmän ripeästi kasvamassa; kaikille se ei ole mahdollista, sillä maailma ei voisi tarjota niille tilaa.

TT1/10 Jos nyt nämä kaksi muunnosta ovat muuntelevaisia, säilyvät tavallisesti eroavimmat niiden muunteluista seuraavien tuhannen sukupolven ajan. Tämän ajan kuluttua oletamme kuvion a^1 muunnoksen tuottaneen muunnoksen a^2 , joka erilaistumisen aatteen mukaan eroaa enemmän A:sta kuin muunnos a^1 . Muunnoksen m^1 oletamme tuottaneen kaksi muunnosta, nimittäin m^2 ja s^2 , jotka eroavat toisistaan ja vielä huomattavammin yhteisestä esivanhemmastaan A:sta. Voimme seurata tätä kehitystä aste asteelta kuinka pitkälle tahansa; muutamit muunnokset ovat jokaisen tuhannen sukupolven kuluttua synnyttäneet yhden ainoan, mutta yhä enemmän erilaistuneen muunnoksen, toiset ovat synnyttäneet kaksi tai kolme muunnosta, muutamit taas eivät ole synnyttäneet ainoatakaan. Siten yhteisen vanhemman A:n muunnokset eli toisintuneet jälkeläiset tavallisesti yhä kasvavat luvultaan ja erilaistuvat ominaisuuksiltaan. Kuviossa on tämä kehitys esitetty kymmenenteen tuhannenteen sukupolveen saakka, sekä suppeammassa ja yksinkertaistutetussa muodossa neljänteentoista tuhannenteen polveen saakka.

TT1/11 Niillä Madeiran hyönteisillä, jotka eivät elä maassa ja joiden, kuten esim. eräiden kukkasista elävien perhosten ja kuoriaisten, täytyy alinomaa käyttää siipiään elantonsa hankkimiseen, eivät siivet — arvelee Wollaston — suinkaan ole surkastuneet, vaan päinvastoin suureenneetkin. Tämä sopii aivan hyvin yhteen luonnollisen valinnan vaikutuksen kanssa. Sillä uuden hyönteislajin tullessa saarelle täytyi luonnollisen valinnan pyrkimyksenä olla joko suurentaa tai pienentää sen siipiä, riippuen siitä, säilyikö suurempi joukko yksilöitä sen vuoksi, että nämä kykenivät menestyksellä taistelemaan tuulta vastaan, vaiko sen vuoksi, että luopuivat koko yrityksestä, ja käyttivät siipiään harvoin tai eivät

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milloinkaan. Näiden hyönteisten laita on ollut sama kuin merimiesten, jotka ovat joutuneet haaksirikkoon lähellä rannikkoa: hyville uimareille on ollut onneksi, jos ovat jaksaneet uida niin pitkälle kuin suinkin, kun taas huonoille uimareille olisi ollut parempi, jos eivät olisi osanneet ensinkään uida ja olisivat pysytelleet laivahylyssä.

TT1/12 Mitä on nyt sanottava kaikkien näiden tosiasioiden johdosta? Me näemme hevosen suvun eri lajien yksinkertaisen muuntumisen kautta tulevan juovikkaiksi, joko jaloistaan kuten sebra tai lavoistaan kuten aasi. Hevosessa näemme tämän taipumuksen esiintyvän voimakkaana ruskean värin ohella — väri, joka lähentelee suvun muiden lajien yleisväriä. Juovien ilmenemisen mukana ei seuraa mitään muodonmuutosta tai muuta uutta ominaisuutta. Voimakkaimpana näemme tämän taipumuksen juovikkaisuuteen esiintyvän useiden mitä erilaisimpien lajien sekasikiöissä. Muistelkaamme nyt tämän seikan yhteydessä eri kyyhkysrotuja: ne polveutuvat kaikki yhdestä kyyhkyslajista (pari kolme alalajia eli maantieteellistä rotua siihen luettuna), joka on väriltään sinertävä ja jolla on eräitä poikkijuovia siivissään y. m. kirjailuja; ja kun jokin rotu yksinkertaisen muuntelun kautta tulee sinertävän väriseksi, ilmaantuvat nämä juovat ja kirjailut poikkeuksetta uudelleen, mutta ilman mitään muuta muodon- tai ominaisuuksien muutosta. Vanhimpia ja puhtaimpia erivärisiä rotuja keskenään risteytettäessä näemme, kuinka 102 sekasikiöissä esiintyy voimakkaana taipumus sinertävän värin ja mainittujen juovien sekä kirjailujen uudelleen ilmaantumiseen. Olen lausunut todennäköisimmän olettamuksen, minkä avulla hyvin vanhojen luonteenominaisuuksien jälleen-ilmaantuminen on selitettävissä, olevan sen, että poikasissa säilyy polvesta polveen taipumus ilmisaattamaan aikoja sitten kadonnut ominaisuus ja että tämä taipumus toisinaan tuntemattomista syistä pääsee voitolle. Juuri äsken näimme, kuinka useilla hevosen suvun lajeilla tavattavat juovat ovat selvemmat tai esiintyvät yleisemmin nuorilla kuin vanhoilla eläimillä. Jos nimitämme kyyhkysrotuja — joista muuttavat ovat satoja vuosia pysyneet muuttumatta — lajeiksi, on niiden laita tässä suhteessa aivan sama kuin hevosen sukuun kuuluvien lajien. Omasta puolestani uskallan rohkeasti luoda katseeni taaksepäin monien tuhansien sukupolvien taa ja kuvittelen mielessäni sebran tapaisesli juovikkaan, mutta kenties aivan toisin rakennetun eläimen, joka on kesyn hevosemme, (polveutukoon tämä sitten yhdestä tai useammasta villistä lajista), aasin, hemionuksen, kvaggan ja sebran yhteinen kantamuoto.

TT1/13 Samalla kertaa panin samalle paikalle muutamia erään toisen lajin, *F. flavan* koteloida sekä muutaman näitä pieniä keltaisia muurahaisia, jotka vielä riippuivat kiinni pesänsä kappaleissa. Tätäkin lajia pidetään joskus, vaikka harvoin, orjana, mikäli Smith kertoo. Vaikka se on pieni laji, on se hyvin rohkea ja minä olen nähnyt sen raivokkaasti käyvän muiden muurahaisten kimppuun. Kerran löysin hämmästykseni riippumattoman *F. flava* muurahaisten yhteiskunnan orjia pitävien *F. sanguinea* muurahaisten keon alla olevan kiven alta; ja kun sattumalta tulin pöyhineeksi kumpaakin pesää, kävivät pikkumuurahaiset hämmästyttävällä rohkeudella suurten naapuriensa kimppuun. Nyt olin utelias näkemään, osaisiko *F. sanguinea* erottaa *F. fuscan* kotelot, joista se tavallisesti kasvattaa orjia, pienen ja raivoisan *F. flavan* kotelosta, joita se harvoin ryöstää. Selvästi saattoi nähdä, että muurahaiset osasivat tehdä eron niiden välillä, sillä näin niiden heti innokkaasti tarttuvan *F. fuscan* koteloihin, kun ne sitävästoin olivat kovin säikähdyksissään kohdatessaan *F. flavan* koteloida taikkapa vaan maatakin niiden pesästä ja juoksivat kiireesti

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tiehensä; mutta neljännestunnin kuluttua, pian sen jälkeen kuin kaikki keltaiset muurahaiset olivat menneet tiehensä, ne rohkaisivat mielensä ja kuljettivat pois kotelot.

TT1/14 Katsoen siihen että ohut vaha on hyvin taipuisaa, ei mielestäni ole kovinkaan ihmeellistä, että mehiläiset työskennellessään kummallakin puolella vahasuikaletta huomasivat, koska ne olivat jyr sineet vahan sopivan ohueksi ja silloin lakkasivat työstänsä. Tavallisista kennoista olen luullut huomanneeni, ettei mehiläisten aina onnistu työskennellä yhtä nopeasti vastakkaisilla puolilla; olen nimittäin huomannut äskenalotetun solun pohjana puolivalmiita vinoneliöitä, jotka toiselta puolelta, jolla mehiläiset nähtävästi olivat työskennelleet liian nopeasti, olivat hiukan koveria sekä vastakkaiselta puolelta, jolla mehiläiset olivat työskennelleet hitaammin, kuperia. Kerran, kun tämä oli hyvin selvään huomattavissa, panin kennon takaisin pesään ja annoin mehiläisten jatkaa työtänsä kotvan aikaa; tarkastaessani sitten uudelleen solua havaitsin, että vinoneliö- levy oli laadittu valmiiksi ja oli nyt aivan tasainen. Koska tuo pieni levy oli äärettömän ohut, oli aivan mahdotonta, että mehiläiset olisivat aikaansaaneet tämän jyr simällä kuperaa puolta. Arvelen että mehiläiset sellaisessa tapauksessa työntävät ja taivuttavat notkeata ja lämmintä vahaa kummaltakin puolelta (olen koettanut itse tehdä tätä ja havainnut sen helposti käyvän päinsä), kunnes se on oikeassa asemassa solujen välissä.

TT1/15 Se tapa, millä mehiläiset rakentavat solunsa, näyttää ensi katsannolla sitäkin vaikeammalta käsittää, kun tiedämme suuren joukon mehiläisiä olevan laatimassa kutakin solua. Mehiläinen rakentaa ensin lyhyen ajan yhtä solua, siirtyen sitten toiseen, jopa niinkin - kuten Hubert mainitsee — että parikymmentä mehiläistä on rakentamassa ensimmäisen solun alkuakin. Olin tilaisuudessa havaitsemaan tämän siten, että sivelin yhden kuusisärmiön syriin tai rakenteilla olevan kennon reunoihin äärettömän ohuelti sulatettua sinooperilla värjättyä vahaa. Huomasin näet tällöin aina, että mehiläiset olivat irrottaneet punaisen vahan ja kiinnittäneet värihiukkaset ympärillä olevien solujen reunoihini ohentaen värin yhtä kevyesti kuin maalari olisi tehnyt sen siveltimellään. Kennon rakentaminen näyttää olevan jonkinmoista tasapainotyötä monien mehiläisten välillä, jotka kaikki vaistomaisesti työskentelevät saman suhteellisen välimatkan päässä toisistaan, kaikki koettavat muovailla yhtäläisiä palloja, sitten rakentaen tai jättäen kovertamatta pallojen välille väliseinät. Oli todella omituista havaita, kuinka mehiläiset vaikeissa tapauksissa, esim. kahden kennonkappaleen kulmittaisesti yhtyessä, hajottivat ja rakensivat uudelleen eri tavalla saman solun, usein palaten muotoon, jonka ne ensin olivat hyljänneet.

TT1/16 Ilmaisevatko nämä monimutkaiset ja omituiset lait nyt sitä, että lajeille on varta vasten annettu hedelmättömyyden lahja, jotta niiden toisiinsa- sekaantuminen luonnossa estyisi? En sitä usko. Sillä miksi olisi hedelmättömyys niin äärettömän eriasteista eri lajeja risteytettäessä, joille kaikille luulisi olevan yhtä tärkeätä, että niiden toisiinsa- sekaantuminen tulisi estetyksi? Miksi hedelmällisyysaste olisi luonnostaan muuntelevainen saman lajin yksilöissä? Miksi muutamat lajit risteytyvät helposti ja kumminkin tuottavat hedelmättömiä jälkeläisiä ja miksi toiset lajit risteytyvät äärettömän vastahakoisesti ja kumminkin tuottavat varsin hedelmällisiä jälkeläisiä? Miksi samojen lajien vastavuoroisten risteytysten tulokset usein niin suuresti erkanevat? Miksi, voidaan

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myöskin kysyä, on sallittu syntyä sekasikiöitä? Tuntuisi kummalliselta, että lajeille olisi suotu erityinen kyky tuottaa sekasikiö- jälkeläisiä, ja että näiden jatkuva lisääntyminen sitten olisi tahdottu ehkäistä suuremmalla tai pienemmällä hedelmättömyydellä, joka ei ole missään tarkassa suhteessa vanhempien ensi risteytymisen helppouteen.

TT1/17 Samoin, jos luonnon lajien joukossa katselemme hyvin selvästi eroavia sukulaismuotoja, kuten esim. hevosta ja tapiiria, ei meillä ole mitään syytä olettaa, että milloinkaan on ollut olemassa suoranaisia välimuotoja, jotka yhdistivät kummankin lajin yhteiseen kantamuotoon. Yhteisen kantamuodon elimistön rakenteella on ollut paljon yleistä yhtäläisyyttä tapiirin ja hevosen kanssa. Mutta joissakin suhteissa kantamuodon rakenne on saattanut huomattavasti erota kummankin jälkeläisen rakenteesta, jopa kenties enemmän kuin nämä eroavat toisistaan. Tämän vuoksi emme kykenisi missään tällaisessa tapauksessa saamaan selville kahden tai useamman lajin kantamuotoa, vaikka tarkasti vertaisimme kantamuodon rakennetta sen toisintuneiden jälkeläisten rakenteeseen, jollei meillä ole katkeamatonta sarjaa välimuotoja.

TT1/18 On luullakseni selitettävissä, miksi geologiset muodostumat ovat jokaisessa seudussa miltei aina katkonaisia, s. o. eivät seuraa toisiaan tarkassa järjestyksessä. Tutkiessani useiden satojen engl. penikulmien pituudelta Etelä- Amerikan rannikkoja, jotka verraten myöhäisinä aikoina ovat kohonneet satoja jalkoja, pisti ennen muuta silmääni se seikka, etten tavannut mitään myöhäisiä maatumia, jotka olisivat olleet kyliksi laajalle ulottuvia säilyäkseen edes lyhyen geologisen aikakauden. Pitkin länsirannikkoa, jolla asustaa omituinen merieläimistö, ovat tertiari maatumat niin heikosti kehittyneitä, etteivät ne luultavasti tule kaukaiseen tulevaisuuteen säilyttämään mitään kertomusta toisiaan seuraavista erikoisista merieläimistöistä. Jos hiukan mietimme asiaa, selvenee meille, miksei Etelä- Amerikan kohoavalla länsirannikolla missään tapaa laajalle ulottuvia muodostumia, jotka kätkisivät poveensa myöhäisen tertiari- ajan jäännöksiä, vaikka sinne aikojen kuluessa on täytynyt laskeutua runsaasti lietettä, päättäen siitä, että rantakalliot ovat tavattomasti kuluneet ja mereen laskee mutaisia virtoja. Selitys on epäilemättä se, että littoraliset ja sublittoraliset kerrostumat myötäänsä kuluvat pois, niin pian kuin ne maan hitaan, vähitellen tapahtuvan nousun johdosta ovat joutuneet aallokon vaikutuksen alaisiksi.

TT1/19 Toinen tärkeä seikka, joka kiinnittää huomiotamme luodessamme yleiskatsauksen eliöiden maantieteelliseen levenemiseen on se, että kaikenlaiset rajat ja vapaata siirtymistä ehkäisevät esteet ovat läheisessä ja tärkeässä suhteessa eri seutujen asukasten erilaisuuksiin. Tätä osottaa Uuden ja Vanhan Maailman miltei kaikkien maaeliöiden suuri erilaisuus, paitsi mannerten pohjois- osissa, missä manteret miltei yhtyvät ja missä ilmaston ollessa hieman nykyisestä eroava, pohjoisen lauhkean vyöhykkeen muodot ovat voineet vapaasti siirtyä mantereelta toiselle, kuten nykyään varsinaiset arktiset muodot. Samaa osottaa Australian, Afrikan ja Etelä- Amerikan asukasten suuri eroavaisuus samoilla leveysasteilla, sillä nämä manteret ovat niin eristetyt toisistaan kuin mahdollista. Kullakin mantereella havaitsimme saman seikan. Korkeiden ja yhdenjaksoisten vuoristoalueiden, suurten erämaiden, jopa leveiden jokienkin vastakkaisilla puolilla tapaamme erilaisia asujamia. Mutta koska vuoriharjanteet, erämaat y. m. eivät ole yhtä ylipääsemättömiä eivätkä nähtävästi yhtä

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vanhaa alkuperää kuin mannermaita erottavat valtameret, ovat eroavaisuudet paljon vähäpätöisemmät kuin ne, jotka ovat ominaisia eri mannerten asukkaille.

TT1/20 Ei voida väittää, etteivät lajit ole luonnontilassa minkään muuntelun alaisia, eikä voida näyttää toteen, että pitkien aikakausien kuluessa tapahtuvan muuntelun määrä on rajoitettu; mitään selvää rajaa ei ole voitu eikä voida vetää lajien ja vakaantuneiden muunnosten välille. Ei voida väittää risteytyneiden lajien olevan poikkeuksetta hedelmättömiä ja risteytyneiden muunnosten poikkeuksetta hedelmällisiä, eikä sitäkään, että hedelmättömyys on jokin luomisessa annettu erikoinen lajintunnus. Se usko, että lajit ovat muuttumattomia luomia, oli miltei välttämätön niin kauan kuin arveltiin maapallon historian käsittävän vain lyhyen ajan. Ja nyt, kun olemme saaneet jonkinmoisen käsityksen kuluneen ajan pituudesta, olemme vain liian kärkkäät enemmittä todisteita olettamaan geologian aikakirjojen kertomuksen olevan siksi täydellisen, että se tarjoisi meille selviä todistuksia lajien muuttumisesta, jos tällaista todella olisi tapahtunut

Appendix 2: Excerpts from the new translation

- TT2/1 Uskoen siihen, että aina kannattaa tutkia tarkemmin jotain tiettyä eliöryhmää, valitsin harkinnan jälkeen kesykyhyt. Kasvatin kaikkia rotuja, joita pystyin ostamaan tai saamaan. Ystävälliset kasvattajat ovat lähettäneet kyyhkynnahkoja eri puolilta maailmaa, erityisesti kunnianarvoisa W. Elliott Intiasta ja kunnianarvoisa C. Murray Persiasta. Eri puolilla maailmaa ja eri kielillä on julkaistu monia kyyhkyjä käsitteleviä tutkielmia. Jotkut niistä ovat huomattavan vanhoja. Liityin yhteen monien tunnettujen kasvattajien kanssa ja pääsin kahden Lontoon kyyhkynkasvattajaseuran jäseneksi. Kyyhkyrotujen määrä on hämmästyttävä. Esimerkiksi englantilaista kirjekyyhkyä ja lyhytnokkaista kuperkeikkakyyhkyä verrattaessa huomio kiinnittyy niiden nokkien hämmästyttävän suureen eroon sekä sitä vastaavaan eroon lintujen kalloissa.
- TT2/2 Se mitä englantilaiset kasvattajat ovat saaneet aikaan, ilmenee niissä tavattoman korkeissa hinnoissa, joita maksetaan hyvän sukupuun omaavista eläimistä. Näitä eläimiä viedään miltei kaikkialle maailmaan. Jalostusta ei yleensä saada aikaan risteyttämällä erilaisia rotuja, ja kaikki parhaat kasvattajat vastustavat kovasti tätä käytäntöä, paitsi joskus lähisukuisten alalajien välillä. Jos valinta tarkoittaisi vain sitä, että erotettaisiin jokin selvästi poikkeava muunnos ja pyrittäisiin sitten lisäämään sitä, olisi toimi niin itsestään selvä ettei siihen juuri kannattaisi kiinnittää huomiota. Valinnan merkitys perustuu siihen, että sen seurauksena perättäisten sukupolvien ajan kertyvät eroavaisuudet muokkaavat lajia tiettyyn suuntaan. Eroja ei harjaantumaton silmä huomaa: olen itsekin sitä turhaan yrittänyt. Ei edes yhdellä ihmisellä tuhannesta ole riittävän tarkkaa silmää ja arvostelukykä, jota vaaditaan erinomaiselta kasvattajalta. Jos hän on tässä suhteessa lahjakas ja opiskelee aihetta vuosien ajan sisukkaasti, hän onnistuu ja saa aikaan suuria parannuksia. Jos häneltä puuttuu jokin vaadittavista ominaisuuksista, hän epäonnistuu varmasti. Harvat ovat valmiita uskomaan, kuinka paljon luonnonlahjakkuutta ja vuosien harjaantumista tarvitaan, jotta tulisi edes taitavaksi kyyhkyjenkasvattajaksi.
- TT2/3 Kasveilla voidaan valinnan kasautuvia vaikutuksia tarkkailla vertailemalla saman lajin eri lajikkeiden kukkien muuntelua kukkatarhassa. Hyötypuutarhassa lehtien, palkojen, mukuloiden, tai minkä hyvänsä arvokkaan osan, monimuotoisuutta voidaan verrata samojen lajikkeiden kukkien moninaisuuteen. Kuinka erilaisia kaalien lehdet ovat, mutta kuinka samanlaisia niiden kukat. Kuinka erilaisia ovat keto-orvokin kukat, mutta kuinka samanlaisia lehdet. Kuinka paljon eri karviaisten marjat poikkeavat kooltaan, muodoltaan ja karvaisuudeltaan, mutta kukissa on hyvin vähän eroja.
- TT2/4 Jopa villi-ihmiset, jotka ovat niin barbaarisia, etteivät lainkaan ajattele kotieläintensä periytyviä ominaisuuksia, säästävät silti jonkin erityisen hyödyllisen eläimen nälänhädän tai muun villi-ihmisten elämässä tyypillisen onnettomuuden kohdatessa. Erinomaiset eläimet tuottavat tavanomaisesti enemmän jälkeläisiä kuin huonommat, joten tässäkin tapauksessa on meneillään tiedostamaton valinta. Jopa Tulimaan barbaarit arvostavat eläimiä, koska he mieluummin tappavat ja syövät vanhat naisensa puutteen aikana, sillä vanhat naiset ovat heille vähäpätöisempiä kuin koirat.

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TT2/5 Kasveissa sama vähittäinen jalostumisprosessi tapahtuu säilyttämällä satunnaisesti parhaat yksilöt riippumatta siitä, onko niitä mahdollista luokitella erillisiksi muunnoksiksi vai ei, tai siitä, ovatko ne syntyneet risteytymisen tuloksena vai ei. Prosessi lisää kokoa ja kauneutta, kuten nyt voidaan nähdä orvokissa, ruusuissa, pelargonioissa, daalioissa ja muissa kasveissa, kun niitä verrataan aikaisempiin muunnoksiin tai kantamuotoihin. Kukaan ei oleta saavansa ensiluokkaista orvokkia tai daaliaa villin kasvin siemenestä. Kukaan ei odota saavansa ensiluokkaista päärynää villipäärynän siemenestä, vaikka onnistuisikin kasvattamaan päärynän villiintyneestä taimesta, jos taimi vain on alun perin puutarhalajiketta. Päärynää on viljelty antiikin ajoista, mutta se vaikuttaa olleen Plinius vanhemman kuvauksen perusteella hyvin heikkolaatuinen hedelmä.

TT2/6 Näin ollen muodon luokittelu lajiksi tai muunnokseksi on sen varassa, mitä kokeneet ja arvostelukykyiset luonnontutkijat sanovat. Usein on kuitenkin pakko päättää tutkijoiden enemmistön mukaan, sillä muutamia selväpiirteisiä ja tunnettuja muunnoksia eivät edes kaikki pätevät asiantuntijat luokittele lajeiksi.

TT2/7 Näitä epävarmoja muunnoksia on runsaasti. Eri tutkijoiden tekemien Ison-Britannian, Ranskan ja Yhdysvaltojen kasvioiden vertailu paljastaa, miten hämmästyttävän monia muotoja on yksi kasvitieteilijä luokitellut omaksi lajeiksi, mutta toinen pelkiksi muunnoksiksi. H.C. Watson, jolle olen paljolti kiitollisuudenvelassa, eritteli minulle 182 brittiläistä kasvia, joita yleisesti pidetään muunnoksina, mutta joista jokaisen on joku botanisti luokitellut omaksi lajikseen, ja Watson oli jättänyt useita polymorfisia sukuja kokonaan sivuun.

TT2/8 Koska tarkastelin lajeja pelkästään selväpiirteisinä ja tarkkarajaisina muunnoksina, oletin isojen sukujen lajeilla olevan tietyn maan alueella enemmän muunnoksia kuin pienten sukujen lajeilla. Siellä, missä on useita lähisukuja (ts. samaan sukuun kuuluvia) lajeja, pitäisi yleissäännön mukaan nyt olla syntymässä monia muunnoksia tai lajien esiasteita. Sieltä, missä kasvaa isoja puita, voi olettaa löytävänsä puiden taimia. Siellä, missä muuntelun kautta on muotoutunut monia samaan sukuun kuuluvia lajeja, ovat olosuhteet suosineet muuntelua, ja siksi voitaisiin olettaa, että olosuhteet olisivat edelleenkin muuntelulle suotuisat. Toisaalta jos lajit tulkitaan luomistapahtuman tuloksiksi, ei ole mitään syytä, miksi monilajisessa ryhmässä esiintyisi enemmän muunnoksia kuin vähälajisessa ryhmässä.

TT2/9 Olemassaolon taistelu johtuu väistämättä kaikkien eliöiden taipumuksesta lisääntyä runsaasti. Jokainen eliö, joka elinaikanaan tuottaa monia munia tai siemeniä, joutuu kokemaan tuhon jossain elämänsä vaiheessa. Muutenhan niiden lukumäärä kasvaisi geometrisessä sarjassa niin hillittömäksi, ettei maa kykenisi elättämään kaikkia. Kun siis yksilöitä syntyy enemmän kuin mitä voi jäädä henkiin, on seurauksena joka tapauksessa olemassaolon taistelu joko saman lajin tai eri lajien yksilöiden kesken tai

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ympäristöolosuhteita vastaan. Olemassaolon taistelu on Malthusin oppi sovellettuna moninkertaisella voimalla koko eläin- ja kasvikuntaan; siinä ei voida ajatella keinotekoisia lisäruokintaa eikä järkevää pidättäytymistä avioliitosta. Vaikka jotkut lajit voivatkin nyt lisääntyä nopeasti, se ei ole kaikille lajeille mahdollista, koska maailma ei pystyisi niitä elättämään.

TT2/10 Jos sitten nämä kaksi muunnosta ovat itsekin muuntelevia, kaikkein eniten muista poikkeava muunnos yleensä säilyy seuraavat tuhat sukupolvea. Tämän jälkeen muunnoksen a^1 uskotaan tuottaneen muunnoksen a^2 , joka ominaisuuksien erilaistumisen periaatteen mukaisesti eroaa enemmän lajista A kuin muunnos A^1 . Muunnoksen m^1 oletetaan tuottaneen kaksi muunnosta, $m^2:n$ ja $s^2:n$, jotka eroavat toisistaan ja vielä enemmän yhteisestä vanhemmastaan A:sta. Tätä kehityskulkua voidaan jatkaa kuinka pitkään tahansa. Jotkut muunnoksista tuottavat kunkin tuhannen sukupolven jälkeen vain yhden uuden muunnoksen, mutta entistä muuttuneemmissa olosuhteissa. Jotkut tuottavat kaksi tai kolme uutta muunnosta, kun taas jotkut eivät tuota yhtään. Yhteisen vanhemman A muunnosten tai muuntuneiden jälkeläisten määrä kasvaa ja ne poikkeavat ominaisuuksiltaan entistä enemmän toisistaan. Kaaviossa tätä kehitystä seurataan kymmenenteentuhanteen sukupolven sekä tiivistetysti ja yksinkertaistetusti neljänteentoistatuhanteen sukupolven saakka.

TT2/11 Siivet eivät ole lainkaan surkastuneet, vaan jopa suurentuneet niillä Madeiran hyönteisillä, jotka eivät etsi ravintoaan maasta ja joiden täytyy ravinnonhaussa kovakuoriaisten ja perhosten tapaan turvautua siipiinsä. Tämä on täysin luonnonvalinnan mukaista. Kun uusi hyönteinen saapui saarelle, luonnonvalinnan pyrkimys suurentaa tai pienentää sen siipiä riippui siitä, selvisikö suurehko yksilöjoukko taistelusta tuulia vastaan vai luopuivatko hyönteiset yrityksestään ja lensivät vain harvoin jos koskaan. Samoin lähellä rannikkoa haaksirikkoutuneen aluksen merimiehistä niiden, jotka ovat hyviä uimareita, olisi ollut parempi pystyä uimaan vielä pitemmälle, kun taas huonojen uimarien olisi ollut parempi luopua kokonaan uimisyrityksestä ja pysytellä hyllyssä.

TT2/12 Mitä pitäisi sanoa tästä kaikesta? Useiden hyvin erillisten hevosen suvun lajien nähdään saavan yksinkertaisen muuntelun kautta raitoja jalkoihinsa raitoja kuten seepralla tai lapoihinsa kuin aasilla. Hevosella tämä taipumus on vahva silloin kun yksilön harmaanruskea väri lähestyy suvun muiden lajien yleistä väritystä. Raitojen ilmaantuminen ei kytkeydy minkäänlaiseen muodon muutokseen tai uuteen ominaisuuteen. Taipumus raidallisuuteen on vahvin kaikkein erilaisimpien lajien risteytymien välillä. Kun tarkastellaan kyyhkysrotuja, havaitaan niiden kaikkien polveutuvan sinertävästä kyyhkystä (mukaan lukien kaksi tai kolme alalajia tai maantieteellistä rotua), jolla on tiettyjä juovia ja muita tuntomerkkejä. Kun jokin rotu muuttuu yksinkertaisen muuntelun kautta sinisävyiseksi, ilmaantuvat nämä juovat ja muut merkit säännönmukaisesti uudelleen, mutta ilman muodon tai mudien ominaisuuksien muutoksia. Kun vanhimpia ja puhtaimpia rotuja risteytetään, on sinisellä värillä sekä juovilla ja merkeillä voimakas taipumus ilmaantua uudelleen risteilyssä. Olen esittänyt, että todennäköisimmän hypoteesin mukaan hyvin vanhakantaisten ominaisuuksien ilmaantuminen uudelleen johtuu peräkkäisten sukupolvien

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nuorten yksilöiden *taipumuksesta* palauttaa tuo kauan kateissa ollut ominaisuus, ja tuntemattomista syistä tämä taipumus pääsee joskus voitolle. Useilla hevosen suvun lajeilla juovat ovat joko selvempiä tai yleisempiä nuorilla yksilöillä kuin vanhoilla. Jos vuosisatoja puhtaina säilyneitä kyyhkysrotuja kutsuttaisiin lajeiksi, niin kuinka täsmälleen vastaavanlainen tapaus se olisikaan hevosen suvun kanssa! Uskaltaudun luottavaisesti katsomaan tuhansien ja tuhansien sukupolvien taakse, ja näen kesyhevosen ja aasin, kulaanin, kvaggan ja seepran yhteisen kantalajin, joka on juovikas kuin seepra, mutta ehkä muuten rakenteeltaan toisenlainen, ja se on saattanut polveutua yhdestä tai useammasta villistä lajista.

TT2/13 Samalla laitoin samaan paikkaan *F. flava* –lajin pesän palasen, niin että pesän rakennusaineista vielä roikkui näitä pieniä keltaisia muurahaisia. Tätäkin lajia otetaan joskus harvoin orjiksi, kuten Smith on kuvaillut. Ollakseen niin pienikokoinen se on hyvin rohkea laji, ja sen on nähty hyökkäävän hurjasti toisia muurahaisia vastaan. Kerran löysin yllätykseni itsenäisen *F. flava* –yhdyskunnan kiven alta vieressään orjia ottavan *F. sanguinean* pesä. Kun olin vahingossa häirinnyt kumpaakin pesää, pikkumuurahaiset hyökkäsivät isojen naapuriensa kimppuun ilhmeen rohkeasti. Minua kiinnosti varmistaa, kykenikö *F. sanguinea* erottamaan *F. fuscan* kotelot, joita ne yleensä ottavat orjikseen, pienen ja hurjan *F. flavan* kotelosta, joita ne harvoin kaappaavat. Oli selvää, että *F. sanguinea* erotti ne heti. On nähty, kuinka innokkaasti ja välittömästi ne kaappasivat *F. fuscan* kotelaita, mutta kohdatessaan *F. flavan* kotelaita tai edes maata niiden pesästä taas ne olivat kovin kauhuissaan ja pakenivat nopeasti. Noin neljännestantun kuluttua, kun kaikki pienet keltaiset muurahaiset olivat ryömineet matkoihinsa, *F. sanguineat* rohkaisivat itsensä, ja kantoivat kotelot pois.

TT2/14 Ottaen huomioon ohuen vahakerroksen taipuisuuden, sen molemmilla puolilla työskentelevien mehiläisten ei mielestäni ollut mitenkään vaikea havaita, milloin ne olivat jyrksineet vahan sopivan ohueksi, ja sitten lopettaa työnsä. Olen havainnut tällaisissa kennostoissa, että mehiläiset eivät aina onnistu työskentelemään täsmälleen samaa vauhtia vastakkaisilla puolilla, sillä olen löytänyt juuri aloitetun kennon pohjasta puolivalmiita suunnikkaita. Ne ovat hiukan koveria siltä puolelta, jossa oletan mehiläisten kaivaneen liian nopeasti ja kuperia vastapuolelta, jossa mehiläiset olivat työskennelleet hitaammin. Yhdessä tapauksessa, kun näin oli ilmiselvästi käynyt, laitoin kennon takaisin pesään ja annoin mehiläisten jatkaa työtään vähän aikaa, ennen kuin jälleen tutkin kennon. Havaitsin, että suunnikas oli nyt täysin tasainen. Suunnikkaan ohuuden vuoksi oli täysin mahdotonta, että se olisi voinut johtua kuperan puolen jyrsimisestä. Luulen, että tällaisessa tapauksessa mehiläiset vastakkaisissa kennoissa työntävät ja taivuttavat taipuisaa ja lämmintä vahaa (mikä on helppoa, olen itse kokeillut) oikeaan asemaansa kennojen väliin ja samalla ohentavat sitä.

TT2/15 Kennojen rakentamistavan ymmärtämistä näyttää aluksi vaikeuttavan se, että lukemattomat mehiläiset työskentelevät yhdessä. Yksi mehiläinen työskentelee vähän aikaa yhdessä kennossa ja siirtyy sitten toiseen, jolloin – Huberin mukaan – jopa ensimmäistä kennoa rakentaa parikymmentä mehiläistä. Pystyin osoittamaan tämän seikan peittämällä

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yhden kennon kuusikulmaiset seinät tai kasvavan kennoston ulkoreunuksen, erittäin ohuella kerrokselle sulatettua punaista vahaa. Joka kerta havaitsin, että mehiläiset levittivät värin hienosti, kuten maalari siveltimellään, ottaen hiukkasittain värillistä vahaa siitä kohdasta, johon se oli laitettu, ja työstäen sitä joka puolelle muodostuviin kennoihin. Rakennustyö näyttää olevan eräänlaista monien mehiläisten välistä tasapainoilua, jossa kaikki seisovat vaistomaisesti yhtä kaukana toisistaan ja pyrkivät rakentamaan ympyröiden välisiä seinämiä korkeammiksi tai jättämään ne jyrsimättä. Oli todella kiinnostavaa havaita, että hankalissa kohdissa, kuten kahden kennoston osan kohdatessa kulmittain, mehiläiset rikkoivat ja rakensivat saman kennon uudelleen eri tavalla, palaten toisinaan aluksi hylkäämäänsä muotoon.

TT2/16 Viittaavatko nämä mutkikkaat ja merkilliset säännöt siihen, että lajeilla olisi hedelmättömyys myötäsyttyisenä ominaisuutena yksinkertaisesti lajien sekaantumisen estämiseksi luonnossa? En usko, että näin on. Miksi monenasteista hedelmättömyyttä esiintyy risteytystilanteissa, jos pitää kuitenkin olettaa, että on yhtä tärkeää estää kaikkia lajeja sekaantumasta? Miksi hedelmättömyys vaihtelee luontaisesti saman lajin yksilöiden kesken? Miksi jotkut lajit risteytyvät helposti mutta tuottavat hyvin hedelmättömiä risteymiä kun toiset taas risteytyvät kovin vaikeasti mutta tuottavat kohtuullisen hedelmällisiä risteymiä? Miksi vastavuoroisen risteytyksen tuloksissa on usein niin suuri ero samojen kahden lajin välillä? Voidaan jopa kysyä, miksi risteymien tuotanto ylipäänsä sallitaan? Lajeille on annettu erityinen voima tuottaa risteymiä, mutta sitten niiden lisääntyminen pysäytetään eriasteisella hedelmättömyydellä, joka ei tarkkaan ottaen ole suhteessa niiden vanhempien ensimmäisen polven risteytymisen mahdollisuuteen. Näyttää kaiken kaikkiaan oudolta järjestelyltä.

TT2/17 Tarkasteltaessa hyvin erilaisia luonnonlajeja, kuten esimerkiksi hevosta ja tapiiria, ei ole syytä olettaa niiden välillä koskaan olleen välimuotoja. Välimuotoja on ollut kummankin lajin ja niiden yhteisen, tuntemattoman kantalajin välillä. Yhteinen kantalaji on muistuttanut rakenteeltaan kovasti tapiiria ja hevosta, mutta se on poikennut muutamissa rakenteen yksityiskohdissa huomattavasti kummastakin, ehkä jopa enemmän kuin hevonen ja tapiiri poikkeavat toisistaan. Olisi siis kaikissa tällaisissa tapauksissa mahdotonta tunnistaa kahden tai useamman lajin kantamuotoa, vaikka kantamuodon rakennetta vertailtaisiin tarkasti sen muuttuneiden jälkeläisten rakenteisiin, ellei tiedossa olisi samalla miltei täydellistä välimuotoketjua.

TT2/18 Kunkin seudun geologiset muodostumat ovat miltei aina ajallisesti epäsäännöllisiä, eli ne eivät seuraa toisiaan välittömästi. Tutkin satojen mailien matkalta Etelä-Amerikan rannikkoa, joka on viime aikoina kohonnut useita satoja jalkoja. Tuskin mikään seikka hämmästytti minua enempää kuin se, ettei rannikoilla ollut niin laajoja viimeaikaista kerrostumia, että ne olisiivat säilyneet edes lyhyttä geologista ajanjaksoa. Pitkin koko länsirannikkoa, jolla elää erikoista merieläimistöä, tertiäärikautiset kerrostumat ovat niin niukkoja, etteivät ne todennäköisesti kykene säilyttämään todisteita useista peräkkäisistä merieläimistöistä. Pienen miettimisen jälkeen ymmärtää, miksei Etelä-Amerikan kohoavalta länsirannikolta löydy mistään paikasta viimeaikaista tai tertiäärikautisia jäänteitä, vaikka

Appendix 2: Excerpts from the new translation

sedimenttitarjonnan täytyy olla suurta, kuten rantakallioiden valtavasta rapautumisesta ja mutaisten jokivesien valumisesta mereen voi päätellä. Selitys on epäilemättä rantavyöhykkeen kerrostumien jatkuva kuluminen pois sitä mukaan kuin ne hitaan ja vaihteittaisen maan kohoamisen seurauksena nousevat rannikon aaltojen jauhattaviksi.

TT2/19 Toisen yleiskatsauksessa paljastuvan, perustavanlaatuisen tosiseikan mukaan kaikenlaiset vapaan liikkumisen esteet liittyvät läheisesti eri alueiden välisiin lajistoeroihin. Tämä nähdään maaeliöiden suuressa eroavaisuudessa Uuden ja Vanhan maailman välillä lukuun ottamatta pohjoisia alueita, missä maamassat miltei kohtaavat ja missä aikoinaan ehkä hiukan erilaisessa ilmastossa pohjoisen lauhkean vyöhykkeen lajisto pääsi liikkumaan vapaasti, kuten arktinen lajisto nykyään. Näin todistaa myös se, että samoilla leveysasteilla olevien Australian, Afrikan ja Etelä-Amerikan lajistot eroavat suuresti toisistaan. Nämä maathan ovat niin eristyneitä toisistaan kuin mahdollista. Sama toistuu jokaisessa maanosassa. Korkeiden ja yhtenäisten vuorijonojen ja aavikoiden eri puolilla ja toisinaan jopa suurten jokien vastarannoilla on erilaista lajistoa. Vaikka vuorijonot, aavikot ja niin edelleen eivät ole läpipääsemättömiä, eivät ne todennäköisesti ole niin pitkäaikaisia kuin mantereita erottavat valtameret. Siten nämä erot ovatkin paljon vähäisempiä kuin mantereiden väliset erot.

TT2/20 Ei voida väittää, etteivät eliöt muuntelisi luonnontilassa tai että muuntelun määrä aikojen kuluessa olisi rajallinen. Mitään selvää eroa ei voida vetää lajien ja selvärajaisten muunnosten välille. Risteytetyt lajit eivät ole säännönmukaisesti hedelmättömiä ja muunnokset hedelmällisiä, eikä hedelmättömyys ole luomisessa annettu erityisominaisuus. Usko lajien muuttumattomuuteen oli miltei välttämätön niin kauan kuin maailman historiaa luultiin lyhyeksi. Nyt kun on saatu parempi käsitys ajan kulumisesta, ollaan ihan liian valmiita perusteettomasti uskomaan geologisen todistusaineiston niin täydelliseksi, että sen pitäisi antaa meille selvät todisteet lajien muuttumisesta, jos sitä olisi todella tapahtunut.